

Anaesthetic Considerations In Endobronchial Ultrasound: A Case Series

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Abstract:

Background:

American cancer guidelines embraced EBUS-TBNA in diagnosing and staging lung cancer and suggested it as the main step in mediastinal staging, over mediastinoscopy. Ultrasonic bronchoscope has a thicker structure compared to standard fibre-optic bronchoscope, and intense mucosal contact is required to get ultrasonic images, and the time of procedure is long to cause significant patient discomfort. There is a need to prevent laryngospasm and reflex coughing during this procedure, as coughing can cause difficulties in obtaining proper view of target lymph nodes or lesion. Given less literature on anesthetic considerations on EBUS, the current case series was done.

Objective: To report two cases who underwent endobronchial ultrasound at our tertiary care centre.

Materials and Methods: This case series was done on 2 patients in the Department of Anesthesiology at NRI Medical College, Mangalagiri, Andhra Pradesh, India from December 2023 to January 2024. Details on anaesthetic considerations were provided.

Results: In 1st patient, EBUS + TBNA of the lesion was done using radial probe, guided into the correct location with C-Arm. The procedure lasted for about 2.5 hours. Post-procedure arterial blood gas analysis showed respiratory acidosis with values: pH - 7.2 PCO₂ – 60, PO₂ – 135 and HCO₃ - 26 mmol/L. The patient was ventilated for 45 minutes and extubated after a repeat ABG which showed normal PCO₂ levels. In 2nd patient, after connecting standard monitors and recording the baseline vital parameters, patient was induced and 3 size LMA was inserted to facilitate visualization of paratracheal lymph nodes & large lumen of LMA facilitated adequate ventilation after insertion of the bronchoscope when compared to 7- or 7.5-mm ID ET tube. The procedure lasted for 2 hours. There were no peri-procedural complications.

Conclusion: Patients posted for EBUS + TBNA are usually of the elderly age group with multiple comorbidities, poor respiratory dynamics and decreased functional reserve of various organs. Hence, they require thorough preoperative evaluation, optimization and planned perioperative management for successful outcomes

Key Words: Endobronchial ultrasound, TBNA, Mediastinoscopy, Anesthetic considerations, Bronchoscope

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I. INTRODUCTION

American cancer guidelines embraced EBUS-TBNA in diagnosing and staging lung cancer and suggested it as the main step in mediastinal staging, over mediastinoscopy.¹ Recently more thoracic surgeons and pulmonologists are adopting EBUS in their clinical practice, and there is a need to understand various factors which improve the performance and yield of EBUS-TBNA. This procedure is organized on an outpatient basis, with discharge after adequate recovery. EBUS-TBNA can be done by a Thoracic Surgeon or by an Interventional Pulmonologist who received adequate training about this procedure. Intravenous catheter and standard American Society of Anaesthesiologists (ASA) monitors are suggested, and continuous monitoring of vital signs and parameters like blood pressure, heart rate and oxygen saturation are mandatory. Oxygen delivery system through the mask with reservoir, or venti-mask or nasal-mask is also recommended. An emergency defibrillator should be available. EBUS instrument and processor, light source, conventional monitor along ultrasound monitor should be kept on the left or the right of the patient. After the procedure, a complete and thorough check of the tracheobronchial tree is mandatory before removal of bronchoscope from the airways, to remove clots and/or secretions, and to control bleeding. Dyspnoea should be evaluated accurately to exclude pneumothorax, asthma,

or airway bleeding. If the patient underwent the procedure under mild sedation only, he/she could be discharged. EBUS is most importantly used for staging of lung cancer.²⁻¹⁰ It helps to eliminate the need invasive mediastinoscopy and subsequent hospital admission.

Anaesthetic considerations:

Ultrasonic bronchoscope has a thicker structure compared to standard fibre-optic bronchoscope, and intense mucosal contact is required to get ultrasonic images, and the time of procedure is long to cause significant patient discomfort. There is a need to prevent laryngospasm and reflex coughing during this procedure, as coughing can cause difficulties in obtaining proper view of target lymph nodes or lesion, decreasing the incidence of accurate insertion of needle. It may also raise the risk of injury to major vessels. Topical anaesthesia is required to suppress the cough reflex, mainly in general anaesthesia, where muscle blockers are not used. Total intravenous anaesthesia (TIVA) gives optimal conditions for EBUS TBNA. It is better compared to volatile anaesthetics, as frequent suctioning of airway leads to contamination of room atmosphere by volatile anaesthetics. This leads to improper delivery of volatile anaesthetic gas to the subject. Combinations of remifentanyl, propofol, etomidate, ketamine are routinely used. Airway is secured by a laryngeal mask airway (LMA) or endotracheal tube (ETT). Considering large size of ultrasonic bronchoscope, LMA is considered a suitable device to secure airway and provide proper ventilation around the bronchoscope. LMA also allows access to lymph node stations that would otherwise be obscured by ETT. It may not be suitable in obesity or untreated gastroesophageal reflux.¹¹ Given less literature on anesthetic considerations on EBUS the current case series was done.

Objective: To report two cases who underwent endobronchial ultrasound at our tertiary care centre.

II. METHODS

The current study was done at a tertiary care centre in India in December 2023 to January 2024.

Study Design: Interventional study.

Study Location: This study was done at a tertiary care teaching hospital in the dept. of General Anesthesiology at NRI Medical College, Andhra Pradesh, India.

Study Duration: 2 months: December 2023 to January 2024

Methodology:

After Involving patients as per the inclusion and exclusion criteria, data collection was done. A detailed history was taken from each patient. Thorough physical examination, vital signs and systemic examination were done.

Ethical considerations: Written Informed consent was obtained from two patients who participated in the study.

III. RESULTS

Case 1:

A 73-year-old male patient who had COPD, presented to pulmonology OPD with a complaint of hemoptysis (3 episodes) and shortness of breath over 2 months. He has a history of weight loss and decreased appetite for 1 month. He has been a known smoker for 40 years, hypertensive and diabetic for 10 years and he was on treatment. HRCT showed a well-defined moderately heterogeneously enhancing soft tissue lesion with a focal speck of calcification seen right upper lobe. Diffuse fibrotic strands in the right upper lobe, enlarged right paratracheal and hilar lymph nodes are seen. Moderate bronchiectasis changes are seen in the right lung with minimal subpleural fibrosis. He was planned for TBNA of the lesion under Peripheral Radial probe EBUS. Blood investigations, ECG, 2D Echo, and airway examination are normal. On auscultation, bilateral crepitations and wheezing are heard. The patient was advised of IV antibiotics, nebulization, and NPO orders. Inj Hydrocortisone 100 mg I.V was administered on the day of the procedure. Standard monitors were connected, baseline vitals recorded and I.V access was secured. After adequate preoxygenation, Inj Glycopyrrolate, Inj Midazolam and inj. Fentanyl were administered, and induction was done using Inj Propofol. Inj Vecuronium was administered to facilitate endotracheal intubation with 8.5 mm cuffed ETT tube. Anesthesia was maintained with O₂:N₂O and Sevoflurane.



Image 1: HRCT findings of lung



Image 2: Catheter mount connect to allow - bronchoscopy Image 3: Catheter mount connected to patient



Image 4 and 5: Peak airway pressures before bronchoscope and increased after insertion of bronchoscope.

EBUS + TBNA of the lesion was done using radial probe, guided into the correct location with C-Arm.

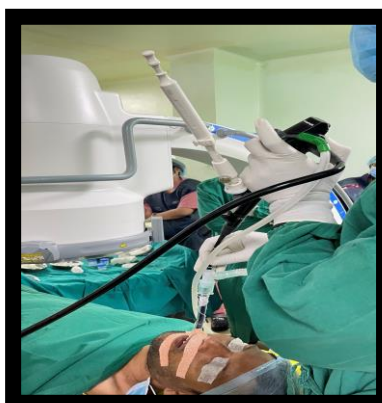


Image 6: Procedure of EBUS

The procedure lasted for about 2.5 hours. Post-procedure arterial blood gas (ABG) analysis showed respiratory acidosis with values: pH - 7.2 PCO₂ - 60, PO₂ - 135 and HCO₃ - 26 mmol/L. The patient was ventilated for 45 minutes and extubated after a repeat ABG which showed normal PCO₂ levels.

Case 2: 54-year-old woman presented with cough and expectoration for last 3 months. She had Pulmonary tuberculosis 30 years back and took ATT. She was hypertensive, diabetic and had ischemic heart disease and she is on medical management. HRCT showed volume loss with irregular mass-like consolidation with dense calcifications in apicoposterior segment of left upper lobe. There are multiple randomly distributed nodular opacities in bilateral lung fields. There are enlarged mediastinal, axillary and abdominal lymph nodes, suggestive of left upper lobe malignancy with bilateral pulmonary metastasis and metastatic lymphadenopathy.

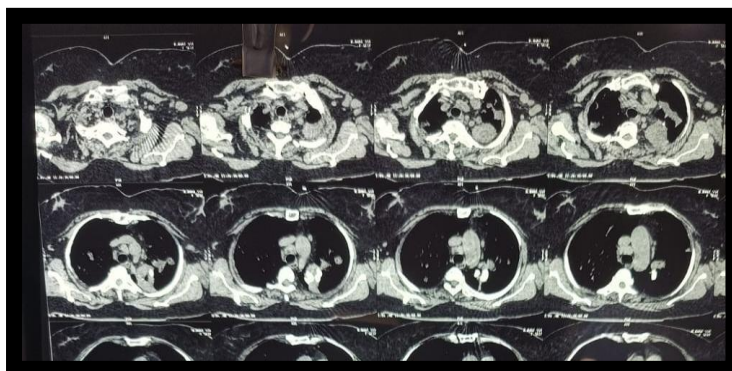


Image 7: HRCT Findings in 2nd patient



Image 8: Swivel adapter to connect to endotracheal tube

On examination, there are reduced left-sided breath sounds with a room air saturation of 92%.

Echocardiography showed normal systolic function with grade I diastolic dysfunction, mild tricuspid regurgitation, and mild and mild pulmonary arterial hypertension. The patient was planned for convex probe EBUS + TBNA. After connecting standard monitors and recording the baseline vital parameters, patient was induced and 3 size LMA was inserted to facilitate:

- 1) Visualization of paratracheal lymph nodes &
- 2) The larger lumen of LMA facilitates adequate ventilation after insertion of the bronchoscope when compared to 7- or 7.5-mm ID ET tube. The procedure lasted for 2 hours. There were no peri-procedural complications.

IV. DISCUSSION

The accuracy of EBUS-TBNA, like TBNA¹² and percutaneous CT-guided fine needle aspiration¹³⁻¹⁴ along with EUS-FNA can be improved by immediate evaluation of the sample by the cytopathologist.¹⁵

Jeyabalan.¹⁶ did a study on patient satisfaction with EBUS-TBNA under slight conscious sedation (patient was given topical lidocaine plus lidocaine and IV midazolam and fentanyl) without anaesthetic assistance. His study included 82 patients. Sensitivity for staging and diagnosis in suspected malignancy was found to be ranging from 80 to 90% and 94.1–88.9%.

Yarmus et al compared 163 procedures done under DS (IV propofol with LM or Endotracheal tube) with 146 procedures done under moderate sedation. The diagnostic yield was better in DS group and more nodes were sampled. However, firm conclusions cannot be drawn as the procedures were done in 2 separate institutions by different surgeons.¹⁷

In another study by Ost et al., general anesthesia and drug induced sedation was associated with more lymph nodes sampled per patient, but it didn't provide higher EBUS-TBNA diagnostic yield.¹⁸

Potential complications of EBUS TBNA are rare but can include:

- 1)Pneumothorax,
 - 2)Pneumomediastinum,
 - 3)Bleeding,
 - 4)Laryngospasm / Bronchospasm
 - 5)Other complications of general anaesthesia.
- A chest X-Ray is performed following radial probe EBUS to rule out pneumothorax.
None of the patients experienced these side effects in our study.

V.CONCLUSION

Communication between interventional bronchoscopists and anaesthesiologists is necessary to plan when anaesthesia services are required and where bronchoscopic procedures should be performed. Patients posted for EBUS + TBNA are usually of the elderly age group with multiple comorbidities, poor respiratory dynamics and decreased functional reserve of various organs. Hence, they require thorough preoperative evaluation, optimization and planned perioperative management for successful outcomes. The study is self-sponsored. There were no conflicts of interest.

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