

# Anaesthesia for Endobronchial Ultrasound-Guided Procedures Using i-gel

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## ABSTRACT

### BACKGROUND

Advancements in the field of EBUS (endobronchial ultrasound) and its applications in the field of interventional pulmonology made it important to develop an office-based out-patient anaesthesia technique for this minimally invasive procedure. The increasing scope of applications in the field of EBUS made the stability and necessity of airway access as one of the determining factors not only for the safety of the patient, but also to cater to the widened horizon of its applications including TBNA, Cryotherapy etc. i-gel as supraglottic airway device can be used for therapeutic intervention procedures like EBUS, TBNA, while providing a secure airway to the anesthetized patient. We wanted to evaluate the efficacy of i-gel for EBUS procedures.

### METHODS

For this observation study, 60 patients of ASA grade: 1-3 scheduled for elective EBUS were included. Patients with limited mouth opening or with airway abscess were excluded from the study. Preoperative oxygen saturation, chest X-ray, ECG, CT chest scan, intra-operative ease of airway access, airway stability (adequate oxygen saturation) were tested taking into consideration the surgeon's comfort, need for emergency treatment or abandoning procedure, post-operative time for extubation, associated complications, readiness for discharge and surgeon.

### RESULTS

The incidence of adverse events during peri-operative period was low and none of the patients suffered hypoxia (SpO<sub>2</sub> <90%). During emergency, 4 patients had cough, 1 patient had bronchospasm and 2 patients complained of sore throat. No considerable variations of baseline haemodynamics were seen with insertion or during removal of i-gel.

### CONCLUSIONS

i-gel as supraglottic airway device can be used for therapeutic intervention procedures like EBUS, TBNA, while providing a secure airway to the anesthetized patient.

### KEYWORDS

i-gel, Laryngeal Mask Airway, Endobronchial Ultrasound, Bronchoscopic Procedures

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**BACKGROUND**

Endobronchial ultrasound (EBUS) and EBUS-TBNA (Tran's bronchial needle aspiration) have emerged as important procedures in interventional pulmonology. The main anesthetic concern during the procedure is that the anesthesiologist and operator share the same working space i.e. the airway, besides the need for securing the airway. Administration of general anaesthesia ensures a secure airway, allowing adequate sampling thereby improving the comfort of operator and patient.<sup>1</sup> Use of LMA (laryngeal mask airway) allows access to higher mediastinal lymph nodes which may be obscured by the ETT (endotracheal tube) hence widening the horizon of end bronchial ultrasound-guided procedures. i-gel is a second generation supraglottic airway (SAD), made of a medical grade thermoplastic elastomer (SEBS), and designed to create a non-inflatable anatomical seal for the pharyngeal, laryngeal and per laryngeal structures.<sup>2</sup> Perks of using i-gel include ease of insertion, a secure airway,<sup>3</sup> providing adequate ventilation around the bronchoscope, allowing access to higher mediastinal lymph node stations that would otherwise be obscured by the ETT and ensuring hemodynamic stability.

**METHODS****Study Design**

This random study was conducted on 60 patients of ASA grades I/II, of both sexes in age group of 18-65 years, posted for endobronchial ultrasound-guided procedures. Informed consent was taken from all the patients enrolled for this observation. The patients were monitored with respect to the ease of insertion, number of insertion-attempts and incidence of peri-operative complications.

**Inclusion Criteria**

ASA (American Society of Anesthesiologists) Grade 1 to Grade 3 patients posted for end bronchial ultrasound and Trans bronchial needle aspiration were included.

**Exclusion Criteria**

Patients with interdental gap of <3 cms, mandibular instability, ASA-grade 4 patients, patients with poor oxygenation status and patients with allergy to used drugs were excluded.

In this observational study, 60 patients of ASA grade 1-3 scheduled for elective EBUS guided procedures, were included and evaluated peri-operatively. Routine requisite investigations like SpO<sub>2</sub> (saturation of peripheral oxygen) and PFT's (pulmonary function tests) were pre-operatively noted. Standard monitors were attached to all the patients, they were pre-oxygenated with 100% oxygen for 3 minutes. Following this, induction was done with Injection Propofol

2-2.5 mg/kg and muscle relaxation facilitated by injecting with Atracurium 0.5 mg/kg. After attaining adequate tranquilization with anaesthesia, i-gel was lubricated with water soluble lubricant jelly and inserted into the patient's pharynx in an extended neck position and ventilation was maintained using a closed circuit with 0.5 FiO<sub>2</sub> (fraction of inspired oxygen). Ease of insertion, airway stability, need for change of i-gel to ETT, episodes of desaturation and bronchospasm were noted intra-operatively. Ease of insertion was graded as easy, satisfactory and difficult based on, the number of times i-gel was inserted and the need for any external manipulation or jaw thrust requirements.

Number of attempts counted were, situations where any difficulty during insertion of i-gel arises and when any need of Oxygenation of the patient with subsequent reinsertion were needed. Inability to secure the airway with i-gel or need for a definitive airway access was accomplished by using endotracheal tube. Any episodes of desaturation with a drop of oxygen saturation  $\leq 90\%$  were noted. Monitoring was done during every 15-minute intervals until completion of the surgery.

Insertion time was recorded by an independent observer and defined as time interval between picking up the device and securing an effective airway. However, if insertion failed at the second attempt, patient was withdrawn from the study and insertion was recorded as a failure and a cuffed endotracheal tube of appropriate size was inserted. If manipulation was required for achieving an effective airway, it was recorded as either 'yes' or 'no' and man oeuvre required was noted. At the end of the procedure, complications like presence of any lip trauma, blood mixed secretions over the SAD at the time of its removal, cough, bronchospasm, sore throat, dysphagia, nausea or vomiting and FTC (Fast track criteria) at 25 minutes after the end of the procedure were observed. SPSS version 10 was used for analysis of statistical data of this study.

**RESULTS**

The incidence of peri-operative adverse events were low. During emergence three patients had cough, two patients complained of sore throat which subsided with lignocaine 1% nebulization; one of the patients had a bloody aspirate with heterogeneous consistency during the TBNA procedure and procedure was abandoned. One patient had bleeding at the site of insertion of the Trans bronchial probe while doing TBNA and developed bronchospasm with desaturation, so the patient had to be intubated and after clinical improvement of the patient, he was slowly weaned off the ventilator and extubated. None the patients suffered from dysphonia or any change of voice. There was no incidence of lip trauma, dental trauma or blood tinged secretions over the i-gel in any case. No significant variations in baseline hemodynamics were seen with insertion or during removal

of i-gel. The compendium summarizing the various results explained is depicted as Table 1.

Ease of i-gel Insertion		No. of Patients
1.	Easy	56 (93.33%)
2.	Satisfactory	4 (6.67%)
3.	Difficult	0 (0.00%)
Number of Attempts		
1.	1	59 (98.33%)
2.	2	1 (1.67%)
Duration of insertion (mean value +S.D, in seconds)		21.21(S.D=5.4)
Episodes of desaturation		1(1.67%)
Patients Requiring Procedures		
Intubation (%)		1(1.67%)
Presence of blood on airway device		0
bronchospasm/ Laryngeal spasm(%)		1(1.67%)
Lip or dental injury		0
Post Removal		
Cough (%)		3 (5%)
Dysphagia, dysphonia (%)		0
nausea or vomiting		2 (2.33%)
Sore throat (%)		0
FTC of 14 at 25 min (%)		59 (98.33%)
<b>Table 1. Compendium Depicting the Summary of the Above Results</b>		

## DISCUSSION

With the advent of advanced use of EBUS and its related procedures like TBNA, Cryotherapy, use of rapid on-site Cytopathology for diagnostic evaluation etc., there is an increase in the need to obtain sufficient tissue for molecular and genetic analysis and an increase in the procedural times which necessitate the need for an adequate tranquilization. Use of general anaesthesia not only ensures a secure airway but also allows adequate sampling and improves the comfort of both the operator and patient. Thereby the overall productive output of the procedure is increased. The outer diameter of the end bronchial scope with model XBF-UC 160F is 6.7 mm and 6.9 mm at the tip. Therefore, the internal diameter of endotracheal tube to be used for this size of EBUS scope should be 8 mm or larger in order to accommodate the EBUS bronchoscope and allow an effective manipulation of the scope during handling of the tissues.

The thickness and limited flexibility of the EBUS bronchoscope, unlike the regular bronchoscopes, further limits the application of the probe to remote locations when used inside an endotracheal tube rather than a laryngeal mask airway. Therefore, use of a laryngeal mask airway is more beneficial when compared to an ETT among the various available LMA's i-gel is a recently introduced LMA which has a higher success rate of insertion and a lower rate of perioperative morbidity. In 2011 Vila E<sup>2</sup> conducted a study regarding the technique of Anaesthesia administered to the patient and satisfaction of the bronchoscopes during EBUS-TBNA (end bronchial ultrasound-guided Tran's bronchial needle aspiration). In a total of sixty-two patients, in one group the procedure was performed under conscious sedation using Inj. Remifentanyl- and Inj. propofol and in the second group topical airway anaesthesia was used.

Satisfaction of the bronchoscopist and patient was higher in the group receiving intravenous sedation. Cough was the main discomfort experienced by both the patient and the endoscopist in his study.

Total intravenous anaesthesia (TIVA) provides optimal conditions for performing bronchoscopies especially needle aspirations in close proximity to major blood vessels in the mediastinum.<sup>1</sup> TIVA is also preferred over volatile anaesthetics despite their ability for faster recovery because frequent suctioning of the airway by the bronchoscopist may results in contamination of the procedure room atmosphere by the volatile anaesthetics especially when use of scavenging system is doubtful and also the delivery of volatile anaesthetic gases to the patient remains inconsistent. The use of volatile anaesthetics which can cause local vasodilatation of the bronchial and pulmonary vasculature may cause increased bleeding at the site of needle puncture of the bronchial mucosa which further interrupts with the procedure efficacy and may result in several adverse side effects. The diagnostic yield and access to the number of lymph nodes sampled using deep sedation is superior to moderate sedation for end bronchial ultrasound trans bronchial needle aspiration.<sup>3,4</sup>

In a randomized trial of end bronchial ultrasound-guided Tran's bronchial needle aspiration under general anaesthesia (GA) versus moderate sedation (MS) the diagnostic yield was 70.7% and 68.9% for the GA group and MS group, respectively.<sup>5</sup> Use of i-gel is better than PLMA in terms of faster insertion and ease of insertion. The incidence of pharyngolaryngeal morbidity was found to be lower with use of i-gel.<sup>6</sup> The success rate of securing the airway was higher using i-gel as it requires less manipulation during insertion owing to a reshaped structure and having an auto sealing capacity due to its chemical composition which is a thermo elastomer. In a study by Helmy AM<sup>7</sup> i-gel was compared with classic LMA in terms of ease of insertion and the incidence of nausea and vomiting in anesthetized but spontaneously ventilated patients. It was observed that the incidence of nausea and vomiting was statistically higher in classic LMA group with a probability value of 0.032 in his study. Insertion of i-gel was significantly easier and more rapid than insertion of classic LMA. In a comparative evaluation among various available supraglottic airway devices i-gel produced the least hemodynamic changes.<sup>8,9</sup>

## CONCLUSIONS

i-gel as a supraglottic device allows the bronchoscopist for adequate manipulation of the bronchoscope and allows access for the scope to locations not easily accessed by endotracheal tube thereby increasing the diagnostic and therapeutic yield of the procedure.<sup>10</sup> The anesthesiologist can also manipulate the respiratory cycle to improve the diagnostic accuracy of the procedure having a secured airway access in a deeply anesthetized patient rather than having an apprehensive and awake patient. Peri-operative adverse events were low with the use of i-gel in EBUS guided

procedures.<sup>11</sup> Moreover, the use of i-gel for EBUS guided procedures widens the horizon of bronchoscopy and its therapeutic and diagnostic applications done on day care basis, allows for fast tracking of the patient and hastens the recovery process assuring the safety of the patient.

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