



# Impact of different sedation modalities on endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA)

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**Abstract:** Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is an important tool in diagnosis and staging of lung and mediastinal disease. However, opinions regarding patient sedation are controversial. Moderate sedation, deep sedation and general anesthesia are widely used with different criteria by many centers. The choice of sedation varies also depending on the type of operator performing the EBUS-TBNA and the location. The operator can be either a thoracic surgeon or a pulmonologist. The thoracic surgeon can have both the endoscopy unit and the operative room available and consequently can perform a triage of patients to be distributed in the two locations. The presence or absence of the anesthesiologist is another variable of the different sedation protocols. In many countries, including Italy, the use of some drugs is restricted to anesthesiologist; therefore, a whole series of sedation protocols performed by bronchoscopists alone would not be reproducible. What emerged from the data analysis is that both mild sedation and deep sedation can be acceptable approaches for EBUS-TBNA. General anesthesia, despite allowing operator's comfort, might be excessive for a maneuver such as EBUS-TBNA and can be proposed in selected cases. The choice about sedation should be modulated on the specific patient's need respecting the operator's best practice.

**Keywords:** Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA); sedation; bronchoscopy

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## Introduction

The spread of the endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) has allowed the progressive improvement of the technique and of the methods of sedation (1). The sedation modality varies among centers and includes moderate sedation/conscious sedation (2-6), deep sedation and general anesthesia (7-9).

What varies in the different Centers is also the figure of the EBUS-TBNA operator and the place where the procedure is carried out. EBUS-TBNA is performed both in the endoscopy unit and in the operating room. The bronchoscopist can be a thoracic surgeon or a pulmonologist who, in some countries also deals with

patient sedation (4,5,10). All these variables involve protocols that are designed based on the operating Centers, without univocal guidelines being established.

## Outline of nomenclatures

In view of the varying sedations among centers, the exact definition of each procedure is important.

Conscious sedation/mild sedation is a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, alone or accompanied by light tactile stimulation. Cognitive function and physical coordination might be impaired but airway reflexes,

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ventilator and cardiovascular functions are unaffected.

Deep sedation is a medication-induced depression of consciousness and patient cannot be easily aroused but respond purposefully following repeated or painful stimulation. Patient may require assistance in maintaining a patent airway and adequate spontaneous ventilation. Cardiovascular function is usually maintained.

General anesthesia is a drug-induced loss of consciousness during which patient is not arousable, even by painful stimulation. Ventilatory function and airway patency are impaired. Positive-pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function.

### **EBUS-TBNA sedation**

EBUS-TBNA is usually performed under sedation and there is no doubt that this facilitates the procedure and the patient's comfort; in US the majority of all bronchoscopies are performed in mild sedation (2). Several studies have analyzed the results of EBUS-TBNA under different types of sedation ranging from conscious sedation to general anesthesia (2-5,7,11), with very few randomized protocols (9,12,13). Yarmus in 2013 reported a better diagnostic yield when EBUS-TBNA was performed in general anesthesia (14). However, few years later, the randomized study by Casal and colleagues, found comparable results in both general anesthesia and mild sedation procedure (9). EBUS-TBNA performed under general anesthesia and deep sedation has been reported to have a better diagnostic yield in patients with sarcoidosis and benign disease (15). It could be that deep sedation allowed a higher number of biopsies though providing more material to the pathologist (14). The ACCP 2016 guidelines suggest a minimum of three passages of the needle to improve diagnostic yield (16). The suggestion is based on only one study (17) and it is possible that other factors also influence the diagnostic yield such as the experience of the bronchoscopist and the possibility of rapid on-site evaluation.

Duration time of EBUS-TBNA is longer in studies using the deep sedation (9) and this is attributed to the need, in mild sedation, to speed up the procedure to avoid patient's discomfort. Not all authors agree on this point, assuming a shorter duration of EBUS-TBNA performed in deep sedation despite, in the study there is not a real comparison with EBUS-TBNA performed in mild sedation (18). The bias in some studies can be determined by the fact that bronchoscopists in training might slow down the

procedures (10).

The contact of the bronchoscope with the bronchial mucosa causes coughing and possible laryngospasm with consequent difficulty for the operator to puncture the target. Some authors believe that it is necessary to prevent any movement of the patient while guaranteeing adequate ventilation, by means of orotracheal intubation or laryngeal mask (8,17). It should be noted that orotracheal intubation prevents access to the lymph node stations 4R and 4L (17) the diameter of the orotracheal tube may not be adequate for the introduction of the bronchoscope (7). Laryngeal mask collects the consent of operators who use deep sedation for EBUS-TBNA allowing adequate ventilation, easy bronchoscope introduction and access to all lymph node stations. Some advanced models, such as the one reported by Zamparelli, allow an easier introduction and manageability of EBUS bronchoscope, avoiding its damage (8). A higher statistical diagnostic yield, compared to those who received mild sedation is described in these series. However, it must be stressed that, general anesthesia or deep sedation with laryngeal mask must be performed in operative room by the anesthesiologist and, in addition to increasing cost, this is not always feasible for all bronchoscopists (2).

Many Centers perform their EBUS-TBNA solely in the endoscopy unit. The location of the exam is partly dependent on the professional figure who performs it. Depending on the organization of the Center, both thoracic surgeons and pulmonologists can deal with bronchoscopy (7,11,14). Thoracic surgeons can take advantage of both the operating room and the endoscopy room and base the choice on the type of sedation according the patient's characteristics and the availability of space. It is important to underline that not all Centers can perform EBUS in the operative room or in the endoscopy unit indifferently, and general anesthesia is not possible in the endoscopy unit in many cases.

Some authors find that both mild sedation and conscious sedation EBUS-TBNA allow control of patient cough and movement, shortening the time of the procedure and protecting airway reflex. Agostini reports also the importance for the patients to follow verbal instructions; nevertheless, he experienced a relatively low diagnostic yield in conscious sedation (4).

The level of patients satisfaction under conscious sedation is reported to be high (3,6) while complications, when analyzed, were most mild, requiring no further intervention (10).

Minor complications such as temporary desaturation,

hypotension, self-restricting bleeding occurred frequently in other patient series undergoing mild sedation (5,12,13). A multivariate analysis by Eapen found that patients undergoing deep sedation had higher incidence of escalation of care such as intensive care unit transfer, compared to mild sedation group (19).

In several studies, sedation is performed directly by the bronchoscopist (thoracic surgeon or pneumologist) without the need of an anesthesiologist (3-7,10,18). In many countries, including Italy, the use of propofol is restricted to anesthesiologist (9,20-22); therefore, a whole series of sedation protocols performed by bronchoscopists would not be reproducible. However, taking into account the legal limitation in our country in the use of sedation drugs, we believe that the anesthesiologist should be part of an EBUS-TBNA team, with the nurse and the bronchoscopist also for the management of possible complications.

## Conclusions

Since EBUS is worldwide available, surely conscious sedation and mild sedation make the procedure feasible in all levels of health care. Both mild sedation and deep sedation can be acceptable approaches, based on the organization of single centers. Deep sedation is useful in case additional procedures are necessary, to collect a higher number of samples and probably when the procedure is performed by bronchoscopists in training.

MS or CS EBUS-TBNA reduce costs, are easy to carry out in the endoscopy unit, they can be used to patients with contraindication for DS or GA obtaining a good level of patient's satisfaction.

Both sedation can be performed without the need of an anesthesiologist however; management of complications could be a limit. There is no need for general anesthesia EBUS-TBNA unless a surgical procedure is provided at the same time.

Finally, in any case, EBUS-TBNA should be carried out in centers with a considerable flow of patients who have developed experience in managing the procedure, complications and training of the bronchoscopists.

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## References

- Vaidya PJ, Chhajed PN. Bronchoscopist-guided sedation in EBUS-TBNA: can the pitcher also be a hitter? *J Bronchology Interv Pulmonol* 2017;24:4-6.
- Boujaoude Z, Arya R, Shrivastava A, et al. Impact of moderate sedation versus monitored anesthesia care on outcomes and cost of endobronchial ultrasound transbronchial needle aspiration. *Pulm Med* 2019;2019:4347852.
- Jeyabalan A, Medford AR. Endobronchial ultrasound-guided transbronchial needle aspiration: patient satisfaction under light conscious sedation. *Respiration* 2014;88:244-50.
- Agostini L, Facciolo N, Lusuardi M, et al. Endobronchial ultrasound-guided transbronchial needle aspiration under conscious sedation with meperidine and midazolam. *Monaldi Arch Chest Dis* 2017;87:768.
- Oztas S, Akturk UA, Alpay LA, et al. A comparison of

- propofol-midazolam and midazolam alone for sedation in endobronchial ultrasound-guided transbronchial needle aspiration: a retrospective cohort study. *Clin Respir J* 2017;11:935-41.
6. Steinfort DP, Irving LB. Patient satisfaction during endobronchial ultrasound-guided transbronchial needle aspiration performed under conscious sedation. *Respir Care* 2010;55:702-6.
  7. Cornelissen CG, Dapper J, Dreher M, et al. Endobronchial ultrasound-guided transbronchial needle aspiration under general anesthesia versus bronchoscopist-directed deep sedation: A retrospective analysis. *Endosc Ultrasound* 2019;8:204-8.
  8. Zamparelli E, Fiorelli A, La Cerra G, et al. LMA® Protector™ versus traditional LMA to perform endobronchial ultrasound-guided transbronchial needle aspiration: a retrospective analysis. *Minerva Anestesiol* 2019;85:756-62.
  9. Casal RF, Lazarus DR, Kuhl K, et al. Randomized trial of endobronchial ultrasound-guided transbronchial needle aspiration under general anesthesia versus moderate sedation. *Am J Respir Crit Care Med* 2015;191:796-803.
  10. Dhooria S, Sehgal IS, Gupta N, et al. Diagnostic yield and complications of EBUS-TBNA performed under bronchoscopist-directed conscious sedation: single center experience of 1004 subjects. *J Bronchology Interv Pulmonol* 2017;24:7-14.
  11. Aswanetmanee P, Limsuwat C, Kabach M, et al. The role of sedation in endobronchial ultrasound-guided transbronchial needle aspiration: Systematic review. *Endosc Ultrasound* 2016;5:300-6.
  12. Stolz D, Kurer G, Meyer A, et al. Propofol versus combined sedation in flexible bronchoscopy: a randomized non-inferiority trial. *Eur Respir J* 2009;34:1024-30.
  13. Schlatter L, Pflimlin E, Fehrke B, et al. Propofol versus propofol plus hydrocodone for flexible bronchoscopy: a randomized study. *Eur Respir J* 2011;38:529-37.
  14. Yarmus LB, Akulian JA, Gilbert C, et al. Comparison of moderate versus deep sedation for endobronchial ultrasound transbronchial needle aspiration. *Ann Am Thorac Soc* 2013;10:121-6.
  15. Gümüş S, Kaya H, Turhan U, et al. The impact of sedation type on diagnostic yield of EBUS-TBNA: looking from another point of view. *Clin Respir J* 2018;12:824-5.
  16. Wahidi MM, Herth F, Yasufuku K, et al. Technical aspects of endobronchial ultrasound-guided transbronchial needle aspiration: chest guideline and expert panel report. *Chest* 2016;149:816-35.
  17. Yasufuku K, Pierre A, Darling G, et al. A prospective controlled trial of endobronchial ultrasound-guided transbronchial needle aspiration compared with mediastinoscopy for mediastinal lymph node staging of lung cancer. *J Thorac Cardiovasc Surg* 2011;142:1393-400.e1.
  18. Franzen D, Schneider D, Weder W, et al. Impact of sedation technique on the diagnostic accuracy of endobronchial ultrasound-guided transbronchial needle aspiration. *Endosc Ultrasound* 2017;6:257-63.
  19. Eapen GA, Shah AM, Lei X, et al. American College of Chest Physicians Quality Improvement Registry, Education, and Evaluation (AQuIRE) Participants 19. Complications, consequences, and practice patterns of endobronchial ultrasound-guided transbronchial needle aspiration: Results of the AQuIRE registry. *Chest* 2013;143:1044-53.
  20. Wahidi MM, Jain P, Jantz M, et al. American College of Chest Physicians consensus statement on the use of topical anesthesia, analgesia, and sedation during flexible bronchoscopy in adult patients. *Chest* 2011;140:1342-50.
  21. Silvestri GA, Gonzales AV, Jantz MA, et al. Methods for staging non-small cell lung cancer: diagnosis and management of lung cancer, 3rd ed: american college of chest physicians evidence based clinical practice guidelines. *Chest* 2013;143;5S:e211S-250S.
  22. DuRand IA, Barber PV, Goldring J, et al. BTS Interventional Bronchoscopy Guideline Group. Summary of the British Thoracic Society guidelines for advanced diagnostic and therapeutic flexible bronchoscopy in adults. *Thorax* 2011;66:1014-5.

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