Educating the Next Generation of Pulmonary Fellows in Transbronchial Needle Aspiration: Leading the Blind to See

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Running Head: TBNA Education of Pulmonary Fellows

Unstructured Abstract – 127
Manuscript Word Count – 1660
Tables/Figures – 0
References – 71

There is no funding available for this study. All work and manuscript writing was performed at The Penn State College of Medicine and The Johns Hopkins School of Medicine. There are no disclosures or potential conflicts of interest related to this work.

CRG is the guarantor of this manuscript, taking responsibility for the integrity of the work as a whole, from inception to published article. CRG, LY, and DFK all contributed in manuscript writing and review.

Dr. Gilbert has no conflicts of interest related to this manuscript.
Dr. Yarmus has no conflicts of interest related to this manuscript.
Dr. Feller-Kopman has no conflicts of interest related to this manuscript.
Abstract

Transbronchial needle aspiration remains an invaluable diagnostic tool in the evaluation of mediastinal and hilar abnormalities, specifically in the evaluation of patients with lung cancer. Training in transbronchial needle aspiration has remained integral in pulmonary fellowship programs, but unfortunately the training methods, volumes, and outcomes have been variable. This has subsequently led to wide variations in practice patterns, diagnostic yield, and operator confidence. The introduction of endobronchial ultrasound guided transbronchial needle aspiration appears to have stimulated a resurgence in training and performance of transbronchial needle aspiration. However, with this new technology many questions have surfaced regarding training methods, volumes, and who should receive training. Within this context, we describe the history, current state, and future directions of the education of transbronchial needle aspiration during pulmonary fellowship training.
Conventional transbronchial needle aspiration (cTBNA) and endobronchial ultrasound guided-transbronchial needle aspiration (EBUS-TBNA) have revolutionized the evaluation and management of patients with intrathoracic lymphadenopathy, including those with suspected lung cancer. The initial descriptions of cTBNA via flexible bronchoscopy by Dr. Ko Pen Wang(1-4) led to widespread dissemination of the technique and subsequent training of the next generation of pulmonary fellows in TBNA.

Diagnostic bronchoscopy, including the performance of transbronchial needle aspiration remains an important procedural competency in the field of pulmonary medicine(5), yet no clear recommendations exist regarding fellow education, whereas general procedural number based competencies exist from sub-specialty societies(6, 7). As described in a recent commentary, debate still exists over the current role of cTBNA and EBUS-TBNA education(8). We sought to describe the current state of TBNA education and offer suggestions for the future training of pulmonary and interventional pulmonary fellows.

**History of Transbronchial Needle Aspiration Training**

Literature pertaining to the education of pulmonary fellows in endoscopy prior to the 1990’s is relative sparse. In the late 1990’s and early 2000’s a number of surveys and review articles became available suggesting that training in flexible bronchoscopic procedures existed, however clear inadequacies were identified, specifically in regards to the education and underutilization of cTBNA(9-11).
Current State of Transbronchial Needle Aspiration Training

Training in TBNA has remained a tenet of basic diagnostic bronchoscopy and cTBNA continues to be taught in the majority of PCCM fellowship programs(12), however surveys demonstrate that bronchoscopy education remains quite variable, including the instruction of TBNA(12-14). Surveys also indicate that cTBNA remains a poorly practiced procedure during and after fellowship(9, 10, 14, 15). Many experts have offered potential explanation including poor diagnostic yields, inability to target small lymph nodes, fear of injuring major vessels or the bronchoscope, and inadequate teaching(9, 16-18).

As noted above, cTBNA continued to remain a requirement for ACGME fellowship training however in the mid to late 2000’s EBUS-TBNA, a novel alteration of the TBNA procedure was introduced. The use of EBUS-TBNA has revolutionized the approach to patients with intrathoracic lymphadenopathy(19-22), demonstrating comparable and in some studies, superior results to mediastinoscopy (19, 23, 24), a fact that cTBNA has never been able to claim.

This resultant change occurring in many high-volume centers has also impacted the education and exposure of cTBNA in PCCM trainees. In 2005, EBUS-TBNA was offered in only 2% of pulmonary training programs(12), but by 2012 that number had skyrocketed to 89%(25). Some centers appear to be teaching EBUS-TBNA in addition to, or in place of cTBNA(25), and a recent study identified that the introduction of an EBUS-TBNA program leads to a
decrease in the number of opportunities for pulmonary fellows to perform cTBNA(26).

Although debate will continue, EBUS-TBNA is firmly established and should be the standard for TBNA sampling of intrathoracic lymphadenopathy and centrally located lesions. Detractors will continue to promote the “benefits” of cTBNA such as low cost, ease of performance and training, as well as diagnostic yield(8, 27).

The Future of Transbronchial Needle Aspiration Training

The American Thoracic Society Task Force on Competencies in Pulmonary and Critical Care Medicine, has recommended the teaching of TBNA as a procedure requiring attention(5). This statement outlines the need for TBNA training to include the appropriate knowledge and procedural skills fundamental to the practice of TBNA, with proficiency or expertise in the procedure being expected at the completion of pulmonary fellowship training (with no description of cTBNA versus EBUS-TBNA). We enthusiastically agree with a need for proper training in TBNA skills of fellows, however, remain concerned in the face of data that basic TBNA skills are not widely taught to pulmonary fellows during their training(12, 25). The authors strongly believe that every pulmonary fellow needs to understand the importance of lymph node staging in lung cancer, mediastinal anatomy, the appropriate evaluation of the pulmonary nodule, and demonstrate an understanding of the risks, benefits, alternatives, and limitations of TBNA, EBUS-TBNA, mediastinoscopy and thoracic surgery in in patients with
intrathoracic abnormalities. Upon completion of fellowship, graduates should also understand the importance of appropriate referrals to other colleagues / institutions if they do not possess the skills or institutional support to perform this evaluation themselves.

If TBNA is to be taught to our pulmonary fellows, how is this best accomplished? The mentor-mentee relationship remains important, however the old model of see one, do one, teach one is more than likely not the best paradigm(28, 29). Numerous studies and new evaluation tools have been recently published, utilizing the help of simulation(30-35), didactic lectures(33, 36, 37), and validated assessment tools(33, 37). The introduction of the B-STAT / EBUS-STAT training and evaluation modules now offer objective evaluation of trainees’ performance as well as standardized nationwide evaluation(33, 37). It would be ideal to develop a standardized curriculum that addresses the necessary knowledge base, procedural and infrastructure requirements that will lead to improved patient care.

The use of ultrasound continues to demonstrate advantages in various fields of medical care. Invasive procedures previously taught utilizing “landmark” techniques have, for good or bad, become antiquated. The evolving role of ultrasound in guidance for procedures such as thoracentesis(38), paracentesis(39), arthrocentesis(40), and central line placement(41, 42) have all demonstrated better outcomes and decreased complication rates. Detractors have often cited concerns for over-reliance on technology and although this
cannot be entirely discounted, the data clearly demonstrates improved outcomes with the use of ultrasound guided techniques.

We believe the future of TBNA training lies in EBUS-TBNA education. EBUS-TBNA remains a safe, efficient tool, demonstrating excellent diagnostic yield, accuracy and overall performance, even when compared to surgical sampling (43, 44). EBUS-TBNA offers a significant advantage in the learner-teacher relationship. The visualization of the learner inserting the needle into the correct (or potentially incorrect) area provides immediate feedback to both the learner and teacher. This type of teaching situation has demonstrated its importance in resident teaching (45, 46).

The Future of EBUS-TBNA Training

EBUS-TBNA is a procedure that most pulmonologists and thoracic surgeons can perform, however current recommendations for EBUS-TBNA competency/proficiency remain a work in progress(6, 7, 25, 47-50). It remains well accepted that numbers alone do not define competency and data suggests that learning curves for EBUS-TBNA vary widely among practitioners (18, 49-52), therefore the ability to provide adequate training volumes in addition to a structured curriculum within a teaching institution remains paramount.

If the often proposed 50 EBUS-TBNA procedures remains the identified benchmark for competency, this may prove difficult for many pulmonary fellows. In 2012, 423 new applicants matched into pulmonary and critical care fellowship programs within the United States(53). In order to accomplish the 50 EBUS-
TBNA procedures for each new fellow, over 21,150 TBNA procedures would need to be available. Review of one of the largest diagnostic bronchoscopy registry’s available (AQuiRE Diagnostic Bronchoscopy Registry) notes that even some “high volume” centers may have difficulty doing more than 200 cases per year(54), enough to only support four fellows. This remains concerning because of two additional points, 1) A 2012 survey of fellowship programs offering EBUS-TBNA noted 93% were performing <50 cases per year(25), 2) Many fellows (more than 30%) are not even obtaining 25 TBNA procedures at completion of their training (12).

Considering the above data, and although disappointing to some, we believe that it will be impossible to train all PCCM fellows to become technically proficient in TBNA skills (EBUS-TBNA and cTBNA) at the completion of their PCCM fellowship. This concept is not new to procedural based medicine specialties as the American Society for Gastrointestinal Endoscopy has previously acknowledged “not all trainees should pursue...nor should all programs offer advanced training”, and that “…training should be concentrated in those programs that have a combination of both patient volume and faculty expertise.”(55) It appears that not all fellows will be able to receive the appropriate time, supervision, and caseload at all institutions to be proficient in TBNA – cTBNA and/or EBUS-TBNA.

*The Role of Interventional Pulmonology*
Although not well studied, the presence of an Interventional Pulmonology (IP) program most likely also has an impact on the education of PCCM fellows. There are currently 26 programs within the United States offering advanced training in Interventional Pulmonology (53, 56, 57). Data suggests that the presence of an IP program leads to an increased volume of procedures, including cTBNA and EBUS-TBNA (25, 26), also identified as a marker of proficiency and improved outcomes (54). We suggest that the exposure of PCCM fellows to the various basic and advanced diagnostic bronchoscopy skills brought by IP training programs will complement and enhance their training, however there are currently no data to support this statement.

Cost of TBNA

The use of cTBNA is often marketed as a low cost and widely available tool (8, 58, 59) compared to EBUS-TBNA. While standard TBNA needles are available at most institutions the data clearly demonstrates that cTBNA training does not lead to widespread availability and successful practice of cTBNA (9, 10). Though the initial investment to establish an EBUS-TBNA program is not insignificant (60), the cost associated with non-diagnostic or incomplete mediastinal staging from cTBNA procedures cannot be discounted (61, 62). It also appears that data continues to demonstrate improved diagnostic yields in higher volume EBUS-TBNA centers (54) with numerous other studies suggesting procedural volumes impact outcomes (54, 63-71). We therefore believe that while TBNA training is important in the education of pulmonary fellows, the
improved patient outcomes and greater diagnostic yield of EBUS TBNA in high
volume centers trumps the otherwise laudable desire to provide such education
in cTBNA, and efforts should be focused on teaching lymph node anatomy and
the importance of mediastinal staging.

Conclusion

The authors believe that the current state of TBNA training remains
problematic in that there is an inherent lack of effective teaching standards and
global volume to support mastering this technique throughout all training
programs. Dedicated techniques including simulation in conjunction with
adequate center based volumes are essential in creating a successful clinical
TBNA program. We hope these more objective education and testing methods
continue to gain in popularity and become accepted in future procedural
guidelines.
References


53. Program NRM. About Medical Specialties Matching Program (MSMP).


56. Pulmonology AAoBaI. Membership in AABIP. 2012.

58. Crocket JA, Wong EY, Lien DC, Nguyen KG, Chaput MR, McNamee C. Cost
effectiveness of transbronchial needle aspiration. Can Respir J.
59. Medford AR, Agrawal S, Free CM, Bennett JA. A prospective study of
conventional transbronchial needle aspiration: performance and cost utility.
60. Pastis NJ, Simkovich S, Silvestri GA. Understanding the economic impact of
introducing a new procedure: calculating downstream revenue of
endobronchial ultrasound with transbronchial needle aspiration as a model.
61. Wahidi MM, Yasufuku K. Point: Should endobronchial ultrasound guide every
transbronchial needle aspiration of lymph nodes? yes. CHEST Journal.
62. Grove DA, Bechara RI, Josephs JS, Berkowitz DM. Comparative cost analysis
of endobronchial ultrasound-guided and blind TBNA in the evaluation of
hilar and mediastinal lymphadenopathy. J Bronchology Interv Pulmonol.
Thrombectomy in Acute Stroke: Utilization Variances and Impact of
64. Markar SR, Penna M, Karthikesalingam A, Hashemi M. The impact of hospital
and surgeon volume on clinical outcome following bariatric surgery. Obes
65. Wouters MW, Gooiker GA, van Sandick JW, Tollenaar RA. The volume-
outcome relation in the surgical treatment of esophageal cancer: a systematic
66. Holzhey DM, Seeburger J, Misfeld M, Borger MA, Mohr FW. Learning
minimally invasive mitral valve surgery: a cumulative sum sequential
probability analysis of 3895 operations from a single high-volume center.
67. West RM, Cattle BA, Bouyssie M, Squire I, de Belder M, Fox KA, et al. Impact of
hospital proportion and volume on primary percutaneous coronary
intervention performance in England and Wales. Eur Heart J.
68. LaPar DJ, Bhamidipati CM, Lau CL, Jones DR, Kozower BD. The Society of
Thoracic Surgeons General Thoracic Surgery Database: establishing
69. Ellis MC, Diggs BS, Vetto JT, Schipper PH. Intraoperative oncologic staging
and outcomes for lung cancer resection vary by surgeon specialty. Ann
70. Pata G, Casella C, Nascimbeni R, Cirillo L, Salerni B. Modifiable risk factors in