that small sample size and only a modest baseline reduction of inspiratory muscle strength prevented a more conclusive answer but, as with COPD, many clinicians will regard these data as insufficient to warrant using IMT for patients with bronchiectasis. Indeed, a recent meta-analysis of IMT for patients with COPD by Geddes and colleagues[16] concluded that it was only effective when using targeted devices that control or provide a target for training intensity.

There are several unanswered issues regarding training for patients with bronchiectasis which mirror the challenges of training for patients with COPD. The intensity, frequency, and duration of training, as well as the optimal strategy for maintenance of benefit, are common to both conditions. Additional issues specific to rehabilitation of patients with bronchiectasis include the optimal approaches for secretion clearance and specific education self-management action plans. Such issues should attract further well designed trials among this population. Bronchiectasis is no longer as common a condition as it used to be, but it is still present and many clinicians will continue to enrol patients with bronchiectasis in pulmonary rehabilitation, modifying the programme to help them tackle the issues specific to their condition. We will also continue to do so, but with slightly more comfort following the evidence of effectiveness described by Newall and colleagues.

Thorax 2005;**60**:889–890.
doi: 10.1136/thx.2005.043810

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REFERENCES

1 **O'Donnell DE**, Aaron S, Bourbeau J, *et al*. State of the Art Compendium: Canadian Thoracic Society recommendations for the management of chronic obstructive pulmonary disease. *Can Respir J* 2004;**11**(Suppl B):7B–59B.
2 **COPD Guidelines Group of the Standards of Care Committee of the BTS**. BTS guidelines for the management of chronic obstructive pulmonary disease. *Thorax* 1997;**52**(Suppl 5).
3 **European Respiratory Society**. Consensus statement: Optimal assessment and management of chronic obstructive pulmonary disease (COPD). *Eur Respir J* 1995;**8**:1398–420.
4 **Lacasse Y**, Wong E, Guyatt GH, *et al*. Meta-analysis of respiratory rehabilitation in chronic obstructive pulmonary disease. *Lancet* 1996;**348**:1115–9.
5 **Griffiths TL**, Burr ML, Campbell IA, *et al*. Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. *Lancet* 2000;**355**:362–8.
6 **Bourbeau J**, Julien M, Maltais F, *et al*. Reduction of hospital utilization in patients with chronic obstructive pulmonary disease: a disease-specific self-management intervention. *Arch Intern Med* 2003;**163**:585–91.
7 **Newall C**, Stockley RA, Hill SL. Exercise training and inspiratory muscle training in patients with bronchiectasis. *Thorax* 2005;**60**:943–8.
8 **Foster S**, Thomas HM. Pulmonary rehabilitation in lung disease other than chronic obstructive pulmonary disease. *Am Rev Respir Dis* 1990;**141**:601–4.
9 **Bradley J**, Moran F, Greenstone M. Physical training for bronchiectasis (Cochrane Review). In: *The Cochrane Library*, Issue 1. Oxford: Update Software, 2003.
10 **Smith K**, Cook D, Guyatt GH, *et al*. Respiratory muscle training, chronic airflow limitation: a meta analysis. *Am Rev Respir Dis* 1992;**145**:533–9.
11 **Lotters F**, Van Tol B, Kwakkel G, *et al*. Effects of controlled inspiratory muscle training in patients with COPD: a meta analysis. *Eur Respir J* 2002;**20**:570–6.
12 **Lacasse Y**, Guyatt GH, Goldstein RS. The components of respiratory rehabilitation programme. A systematic overview. *Chest* 1997;**111**:1077–88.
13 **Weiner P**, Magadle R, Beckham W, *et al*. Maintenance of inspiratory muscle training in COPD patients: 1 year follow-up. *Eur Respir J* 2004;**23**:61–5.
14 **Polkey MI**, Moxham J. Improvement in volitional tests of muscle function alone might not be adequate evidence that inspiratory muscle training is effective. *Eur Respir J* 2004;**23**:5–6.
15 **Harver A**, Mahler DA, Daubenspck JA. Target inspiratory muscle training improve respiratory muscle function and reduces dyspnea in patients with chronic obstructive pulmonary disease. *Ann Intern Med* 1989;**111**:1171.
16 **Geddes EL**, Reid WD, Crowe J, *et al*. Inspiratory muscle training in adults with chronic obstructive pulmonary disease: a systematic review. *Respir Med* 2005 (in press).

TBNA in the evaluation of patients with lung cancer

Usefulness of transbronchial needle aspiration in evaluating patients with lung cancer

S Gasparini, G A Silvestri

There is a need to promote more widespread use of TBNA for evaluating NSCLC

Since the introduction of flexible bronchoscopes in 1968,[1] various ancillary related methods of sampling lung tissue have been developed to greatly expand the diagnostic capabilities of the procedure. Perhaps the most important innovation has been the development of needles with the ability to puncture the tracheobronchial wall, allowing the bronchoscopist to go beyond the barrier of the airways to obtain specimens from both hilar and mediastinal structures.

After the publication of Dr Ko-Pen Wang's initial experience with transbronchial needle aspiration (TBNA) in the 1980s,[2 3] it became clear that this technique had great potential in both the diagnosis and staging of lung cancer as well as other diseases. The only limiting requirement is that the lymph node must be in close contact with the airways, which is most frequently the case in patients with lung cancer. Despite numerous publications highlighting the safety and accuracy of this procedure, the technique is still underused by pulmonologists. Based on data compiled from Europe and the United States, it has been estimated that the percentage of pulmonologists using TBNA is between 11% and 30%.[4–6]

The three most often cited reasons for not performing TBNA are: (1) problems with the technique (30%); (2) a belief that TBNA is not useful (30%); and (3) the lack of on-site cytopathology to assess the adequacy of the specimen (14%).[7]

The belief that TBNA is not useful deserves further exploration. There appears to be confusion in the literature regarding the diagnostic accuracy of this procedure. There is uniform agreement that the specificity is high (approaching 100%) with very few false positives. However, the sensitivity varies greatly in the literature and is influenced by factors such as the size and location of the lymph nodes,[8 9] the type of needle used,[10] the number of aspirates performed,[11] the nature of the lesion,[12] the availability of immediate cytological assessment,[13] and the means of guidance.[14] The sensitivity of TBNA also depends on the skill of the operator, and even experienced bronchoscopists may be frustrated by discouraging results during their first attempts with TBNA where performance requires some technical knowledge that is not intuitive. Several studies have shown that the

sensitivity of the technique may improve greatly with training.[15–17] Another factor in evaluating the sensitivity of TBNA is that some studies do not verify negative results by the gold standard (mediastinoscopy), making it difficult to identify the true incidence of true and false negatives. In fact, sensitivity is sometimes reported as a range varying from the worst case scenario (all the negative TBNA results are considered as false negatives) to the best case scenario (all the negative TBNA results are considered as true negatives).[8]

In this context the meta-analysis by Holty and colleagues published in this issue of *Thorax* makes a considerable contribution to the clarification of this subject by estimating the diagnostic accuracy of TBNA in the staging of patients with non-small cell lung cancer (NSCLC).[18] The authors examined the results of 13 studies (selected out of 67; 54 studies were excluded because they provided insufficient data to calculate sensitivity or specificity or enrolled fewer than 90% of subjects with NSCLC). The results of this analysis confirm the safety of TBNA (0.3% major complication rate) and the high specificity of this technique (99%: only four false positive results in the eight studies that surgically confirmed all TBNA results). Conversely, Holty *et al*[18] were not able to confirm the high sensitivity of 76% reported in a previous recent meta-analysis,[19] identifying the prevalence of mediastinal lymph node metastases as a source of variability. When considering the five more methodologically rigorous studies in which the prevalence of lymph node metastases was low (34%), the pooled sensitivity was surprisingly poor (39%), while in the eight studies that used suboptimal methodological criteria and in which the prevalence of mediastinal metastases was 81%, TBNA sensitivity was 78%. The conclusions of Holty *et al* are that the accuracy of TBNA depends critically on the prevalence of mediastinal lymph node involvement and that, in the patient population with a low prevalence of mediastinal disease (patients who could benefit from surgery), the sensitivity of the technique is really poor.

Should these conclusions diminish the value of TBNA in the staging of NSCLC and discourage bronchoscopists from using this technique more extensively? We do not think so. The algorithm for evaluating a patient with suspected lung cancer should include a chest CT scan at the outset to evaluate the size and location of the mass and the presence of adenopathy. If the patient has enlarged mediastinal lymph nodes in areas accessible by TBNA, a bronchoscopic examination should be performed guided by the CT findings. In this setting, TBNA can provide both the diagnosis and stage simultaneously in a minimally invasive setting, thus obviating the need for any further invasive investigations. The sensitivity should be high because the prevalence of mediastinal lymph node involvement can be expected to be high based on the CT findings. This meta-analysis makes that point painstakingly clear. Still, even if the sensitivity were as low as 40%, we believe TBNA would be worthwhile as it would avoid further invasive testing in 40% of patients. It should also be noted that this technique has been the only method to yield a diagnosis in 18–38% of patients[7 8] in whom lung cancer presented without endobronchial involvement.

Pulmonologists should read carefully the work of Holty *et al*, even to improve their methodology for conducting studies on TBNA. It is surprising that, as reported by the authors, 76% of the published papers on TBNA were excluded from this meta-analysis because they provided insufficient data to calculate sensitivity or specificity! Future work on this technique should use more rigorous methodological criteria to satisfy the quality level required to evaluate precisely the diagnostic accuracy of TBNA.

Clinicians who are already performing TBNA must continue to make every effort to improve their skills and diagnostic accuracy. We are encouraged by a recent survey that showed that 90% of trainees in US pulmonary fellowship training programs are learning TBNA and 60% are reaching competency numbers set out by the American College of Chest Physicians.[20 21] Those who are not yet performing this technique should consider acquiring the necessary skills to perform the procedure and then practise, practise and practise: results will come. Performing TBNA during the initial bronchoscopic examination when there is an indication will optimise the care of the patient with lung cancer.

Thorax 2005;**60**:890–891.
doi: 10.1136/thx.2005.048728

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REFERENCES

1 **Ikeda S**, Yanai N, Ishikawa S. Flexible bronchofiberscope. *Keio J Med* 1968;**17**:1.
2 **Wang KP**, Brower R, Haponik EF, *et al*. Flexible transbronchial needle aspiration for staging of bronchogenic carcinoma. *Chest* 1983;**84**:571–6.
3 **Wang KP**, Terry PB. Transbronchial needle aspiration in the diagnosis and staging of bronchogenic carcinoma. *Am Rev Respir Dis* 1983;**127**:344–7.
4 **Gasparini S**. Transbronchial needle aspiration: the European experience (abstract). Tenth International Course of Interventional Bronchoscopy, Barcelona, April, 2002.
5 **Haponik E**, Russell G, Beamis J, *et al*. Bronchoscopic training: current fellows' experiences and some concerns for the future. *Chest* 2000;**118**:625–30.
6 **Smyth CM**, Stead RJ. Survey of flexible fiberoptic bronchoscopy in the United Kingdom. *Eur Respir J* 2002;**19**:458–63.
7 **Haponik EF**, Shure D. Underutilization of transbronchial needle aspiration. *Chest* 1997;**112**:251–3.
8 **Patelli M**, Lazzari Agli L, Poletti V, *et al*. Role of fiberscopic transbronchial needle aspiration in the staging of N2 disease due to non-small cell lung cancer. *Ann Thorac Surg* 2002;**73**:407–11.
9 **Harrow EM**, Abi-Saleh W, Blum J, *et al*. The utility of transbronchial needle aspiration in the staging of bronchogenic carcinoma. *Am J Respir Crit Care Med* 2000;**161**:601–7.
10 **Schenk DA**, Chambers SL, Derdak S, *et al*. Comparison of the Wang 19-gauge and 22-gauge needles in the mediastinal staging of lung cancer. *Am Rev Respir Dis* 1993;**147**:1251–8.
11 **Chin R Jr**, McCain TW, Lucia MA, *et al*. Transbronchial needle aspiration in diagnosing and staging lung cancer. How many aspirates are needed? *Am J Respir Crit Care Med* 2002;**166**:377–81.
12 **Sharafkhaneh A**, Baaklini W, Gorin AB, *et al*. Yield of transbronchial needle aspiration in diagnosis of mediastinal lesions. *Chest* 2003;**124**:2131–5.
13 **Davenport RD**. Rapid on-site evaluation of transbronchial aspirates. *Chest* 1998;**98**:59–61.
14 **Herth FJ**, Becker HD, Ernst A. Ultrasound-guided transbronchial needle aspiration. An experience in 242 patients. *Chest* 2003;**123**:604–7.
15 **De Castro FR**, Diaz Lopez F, Serdà GJ, *et al*. Relevance of training in transbronchial fine-needle aspiration technique. *Chest* 1997;**111**:103–5.
16 **Haponik EF**, Cappellari JO, Chin R, *et al*. Education and experience improve transbronchial needle aspiration performance. *Am J Respir Crit Care Med* 1995;**151**:1998–2002.
17 **Li-Han Hsu, Chia-Chuan Liu, Jen-Sheng Ko**. Education and experience improve the performance of transbronchial needle aspiration. A learning curve at a cancer center. *Chest* 2004;**125**:532–40.
18 **Holty J-EC**, Kuschner WG, Gould MK. Accuracy of transbronchial needle aspiration for mediastinal staging of non-small cell lung cancer: a meta-analysis. *Thorax* 2005;**60**:949–55.
19 **Toloza EM**, Harpole L, Detterbeck F, *et al*. Invasive staging of non-small cell lung cancer. A review of the current evidence. *Chest* 2003;**123**(1 Suppl):157–66S.
20 **Pastis NJ**, Nietert PJ, Silvestri GA. Variation in training for interventional pulmonary procedures among US pulmonary/critical care fellowships: a survey of fellowship directors. *Chest* 2005;**127**:1614–21.
21 **Ernst AE**, Silvestri GA, Johnstone D. Interventional pulmonary procedures: guidelines from the American College of Chest Physicians. *Chest* 2003;**123**:1693–717.