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Transbronchial vs Transesophageal Needle Aspiration Using an Ultrasound Bronchoscope for the Diagnosis of Mediastinal Lesions

A Randomized Study

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BACKGROUND: The purpose of this study was to compare the tolerance, efficacy, and safety of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) with transesophageal endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) with an endobronchial ultrasound scope for the first pathologic diagnosis of lesions accessible by both procedures.

METHODS: Patients who had lesions accessible by both EBUS-TBNA and EUS-FNA were enrolled and were randomized to undergo either procedure. Patients quantified tolerance, and operators charted the quality of examination using a 100-mm visual analog scale (VAS).

RESULTS: A specific diagnosis was made in 50 of 55 patients (91%) in the EBUS-TBNA group and in 48 of 55 patients (87%) in the EUS-FNA group ($P = .76$). Compared with EBUS-TBNA, EUS-FNA was associated with a shorter duration of procedure (median, 15.3 min vs 11.3 min; $P < .001$), lower doses of IV midazolam (mean, 4.4 mg vs 4 mg; $P = .02$) and intraairway lidocaine (mean, 303 mg vs 189 mg; $P < .001$), less frequent oxygen desaturations (23 of 55 vs two of 55, $P < .001$), and higher operator satisfaction ($P < .001$). There was no significant difference in patient tolerance according to the patients' VAS. Lymph node infection occurred in one patient in the EBUS-TBNA group and in two patients in the EUS-FNA group.

CONCLUSIONS: Both EBUS-TBNA and EUS-FNA provide high accuracy with good tolerance, although the occurrence of infectious complications should be monitored carefully. EUS-FNA has the advantage of comparable tolerance with fewer doses of anesthetics and sedatives, a shorter procedure time, and fewer oxygen desaturations during the procedure.

TRIAL REGISTRY: UMIN Clinical Trials Registry; No.: UMIN000005757; URL: http://www.umin.ac.jp/ctr/

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ABBREVIATIONS: EBUS = endobronchial ultrasound; EBUS-TBNA = endobronchial ultrasound-guided transbronchial needle aspiration; EUS = endoscopic ultrasound; EUS-FNA = endoscopic ultrasound-guided fine-needle aspiration; VAS = visual analog scale

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Mediastinal lesions adjoining both the trachea/bronchus and the esophagus can be evaluated by both endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) and transesophageal endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA).[1] In fact, many investigators have reported the usefulness of EBUS-TBNA or EUS-FNA as the first diagnostic procedure for mediastinal lesions such as lung cancer[2,3] and sarcoidosis.[4-6] Traditionally, EUS-FNA has been performed with an endoscopic ultrasound (EUS) scope by an endoscopist, but several investigators[7-11] have reported that the procedure can be performed using an endobronchial ultrasound (EBUS) scope in place of an EUS scope. Thus, bronchoscopists can select either EBUS-TBNA or EUS-FNA using the same devices for examining lesions adjacent to both the trachea/bronchus and the esophagus.

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However, it is unknown which procedure should be selected for examining such lesions. The purpose of this study was to compare the tolerance, efficacy, and safety of EBUS-TBNA vs EUS-FNA with an EBUS scope for the diagnosis of accessible lesions by both techniques.

Materials and Methods

Patients

A prospective study that was approved by the institutional review board of Nagoya Medical Center (identifier: 2011-403) and registered with the UMIN-Clinical Trials Registry (identifier: UMIN000005757) was carried out. Between May 2011 and January 2013, patients with hilar/mediastinal lymph nodes or tumors that were accessible with both EBUS-TBNA and EUS-FNA, who needed to have a definitive diagnosis, were enrolled. Patients who had been given a definitive pathologic diagnosis prior to bronchoscopy (eg, patients with proven lung cancer for only mediastinal staging purposes) were excluded. Patients who needed to undergo other bronchoscopic procedures such as transbronchial biopsy, brushing, and BAL were also excluded. Patients who had lesions for which either EBUS-TBNA or EUS-FNA was obviously more suitable than the other (eg, EBUS-TBNA preferred: lymph node stations 2R, 4R, and hilar lymph nodes; EUS-FNA preferred: lymph node stations 8, 9, and occasionally 5) were also excluded. Thus, the locations of the main target lesion we expected were nodal stations 2L, 3p, 4L, 7, and lung mass adjacent to the mediastinum, but some lesions in other locations accessible by both procedures (eg, large extended lesions) were also included. Randomization for EBUS-TBNA or EUS-FNA was performed by minimization with stratification factors including lymph node location (subcarinal lymph node vs others), lymph node size ($\geq$ 20 mm vs $<$ 20 mm), number of target lymph nodes (one vs two or more lesions), operator experience (staff pulmonologists vs pulmonary residents $\leq$ 5 years after receiving their MD degree), and the use of rapid on-site cytologic evaluation. Written informed consent was obtained from all patients.

Procedures

For EBUS-TBNA and EUS-FNA, a convex probe EBUS scope (BF-UC260F-OL8 or BF-UC260FW; Olympus Corporation) and 22-gauge needles (NA-201SX-4022; Olympus Corporation) were used. The endoscopic procedures were performed by staff pulmonologists or supervised pulmonary residents. Before the procedure, the upper airway was anesthetized with 4% lidocaine through a nebulizer, and bolus IV midazolam was administered for both procedures. The doses of lidocaine and midazolam were not defined in the study protocol.

In patients assigned to the EBUS-TBNA group, the procedure was performed in a manner similar to that described previously.[12] After the insertion of an EBUS scope into the trachea, 2% lidocaine was administered into the trachea and bronchus through the working channel using a spray catheter, and then needle aspirations for the target lesion were performed. The use of rapid on-site cytologic evaluation depended on the operator. Three punctures for each lesion were made regardless of the result of rapid on-site cytologic evaluation, but additional punctures were permitted if the operator considered them necessary. Additional 2% lidocaine into the airway or IV midazolam was administered properly during the procedure if the operator deemed it necessary. If oxygen saturation decreased to $<$ 90% for more than 20 s during the procedure, oxygen supplementation was provided to maintain oxygen saturation at $>$ 90%. The lesion location examined; the number of the punctures; the duration of the procedure, which was measured from insertion to removal of the EBUS scope through the vocal cord; the dose of intraairway lidocaine and IV midazolam administered; and supplemental oxygen administration were recorded.

In patients assigned to the EUS-FNA group, the procedure was performed at the left lateral position as described previously.[9] Handling of sampled specimens, the puncture number, and the recorded items were the same as with the EBUS-TBNA procedures.

Questionnaire

Before randomization, patients charted their anxiety on a 100-mm visual analog scale (VAS) (0 = no anxiety, 100 = extreme anxiety). Two hours after the procedure, patients assessed the following items with VAS: discomfort (0 = no discomfort, 100 = not tolerable), satisfaction (0 = not satisfactory, 100 = fully satisfactory), cough (0 = nonexistent, 100 = unbearable), vomiting (0 = nonexistent, 100 = unbearable), pain (0 = nonexistent, 100 = unbearable), and dyspnea (0 = nonexistent, 100 = unbearable). Operators also assessed their satisfaction and the patient's cough with VAS after the procedure.

Study End Points

The primary end point was to compare the patient-reported discomfort assessed with VAS during EBUS-TBNA and EUS-FNA. The secondary end points were to compare patient-reported satisfaction, sensations, operator-reported satisfaction and patient's cough, diagnostic yield, procedure durations, doses of sedatives and anesthetics, and complications between the two procedures.

Statistical Analysis

In our previous study,[13] the mean VAS score on the patient's discomfort during bronchoscopy including EBUS-TBNA was 41.6 $\pm$ 31.9 mm. Because the minimal clinically important difference with the VAS score has not been established, we simply calculated a sample size to compare the mean VAS scores between EBUS-TBNA and EUS-FNA. We estimated that with 110 patients, the study would have 90% power to detect a significant difference in the VAS score at the level of .05 with an effect size of 0.65 SD between the two diagnostic procedures. Continuous variables were analyzed using the Mann-Whitney *U* test, and dichotomous variables were analyzed using the Fisher exact test. The results were considered statistically significant when the two-tailed *P* value $\leq$ .05. Statistical analyses were performed using a statistical software program (PASW Statistics 18; IBM).