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ORIGINAL ARTICLE

Endobronchial ultrasonography-guided transbronchial needle aspiration, an effective modality for sampling targeted thoracic lesions in adult lung transplant recipients

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Endobronchial ultrasonography-guided transbronchial-needle aspiration;
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Introduction Lung transplantation (LTx) is performed for end-stage lung diseases that would be otherwise fatal. Pulmonary allograft recipients are a unique patient population as they are at high risk for malignancy and infectious complications due to the need for immunosuppression. Endobronchial ultrasonography (EBUS)-guided fine-needle aspiration (FNA) is a minimally invasive technique for evaluating abnormalities of the mediastinum/lungs. To our knowledge, this report is the first in the literature addressing targeted EBUS-FNA biopsies in patients who have undergone LTx.

Material and methods During 5 years from May 1, 2009 to May 1, 2014, 582 patients underwent LTx at the Cleveland Clinic. A review of records indicated that 14 of these patients later underwent EBUS-FNA. Demographic and diagnostic parameters were recorded.

Results A total of 14 patients (mean age 64 years) underwent EBUS-FNA after LTx. The mean interval between LTx and EBUS-FNA was 15 months. EBUS-FNA yielded cytologic material diagnostic of malignancy in 10 patients (71%) with one-half of those cases being squamous carcinomas.

Conclusions EBUS-FNA is a useful diagnostic modality in lung allograft recipients and is of value in confirming and staging thoracic malignancies in this population. Carcinoma subtyping is feasible by EBUS-FNA, and performance of ancillary studies to confirm clonality in post-transplant lymphoproliferative disorders is possible.

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Introduction

Lung transplantation (LTx) is a treatment option for persons with end-stage pulmonary diseases that would be otherwise fatal. In adults, the most common indications for LTx include chronic obstructive pulmonary disease, idiopathic pulmonary fibrosis, cystic fibrosis, alpha-1-antitrypsin deficiency, and idiopathic pulmonary arterial hypertension.[1] Worldwide, approximately 3600 lung transplants are currently performed on an annual basis.[2] Improved transplantation outcomes are seen through early referrals to specialized centers where evaluations based on guidelines for candidate selection are employed to determine which patients are the most appropriate candidates for transplantation.[3] Unfortunately, a shortage of donor organs leads to many patients (up to 20% of those considered candidates for transplantation in Western countries) dying before an allograft becomes available.[2] Research in pulmonary transplantation is actively evolving with large publicly available datasets in addition to multicenter networks and single-center studies making significant contributions to general knowledge of and clinical care in areas of donor selection, clinical outcomes, mechanisms of rejection, infectious complications, and chronic allograft dysfunction.[4] Long-term outcomes for lung transplant patients are still poorer than those seen with other solid organ transplants, such as kidney, liver, and heart recipients.[5] Chronic lung allograft dysfunction remains the leading cause of mortality after LTx.[6] Accordingly, recipients of pulmonary allografts undergo close functional and clinical monitoring. In this context, emerging techniques such as minimally invasive endobronchial ultrasonography (EBUS)-guided transbronchial-needle aspiration (TBNA) are being applied to lung transplant patients in some centers. EBUS-TBNA allows for diagnosis and staging of lung neoplasms and can also be valuable in the work up of other thoracic neoplastic, reactive, and infectious conditions, potentially sparing patients from the need for thoracotomy and/or mediastinoscopy.[7] Whereas a previous monograph detailing EBUS for the quantitative assessment of bronchial mural structures in lung transplant recipients exists, there is no existing literature on EBUS-TBNA procedures specific to lung transplant patients.[8] Herein, we convey our experience of EBUS-TBNA in patients treated with LTx at the Cleveland Clinic during the 5-year interval from May 2009 through May 2014.

Materials and methods

During the 5-year interval from May 2009 to May 2014, 582 patients underwent LTx at the Cleveland Clinic. Of these 582 patients, 399 (69%) were male and 183 (31%) were female. The mean age of the transplant population at the time of operation was 59 years. Although all patients were monitored for follow-up, rejection, infection, etc, a review of electronic records indicated that a small subset, 2.4% (14 of 582), of these patients underwent EBUS-TBNA following LTx. Records from these 14 patients were reviewed, and pertinent details were gleaned for tabular summarization. Information that was gathered included the age of each patient at the time of LTx, the interval in months between LTx and EBUS procedure, the patients' sex, laterality of allograft placement (right versus left versus bilateral), the underlying disease process necessitating transplantation, the reason/trigger for EBUS-guided biopsy, the anatomic locations of the EBUS biopsies, the EBUS probe types, and the EBUS-TBNA diagnoses. This study was approved by the Cleveland Clinic Institutional Review Board.

Results

During the 5-year interval from May 2009 through May 2014, 14 lung transplant patients (mean age 64 years) underwent EBUS-TBNA at the Cleveland Clinic. Of these patients, 64% (9 of 14) were male, and 36% (5 of 14) were female. Usual interstitial pneumonia (idiopathic pulmonary fibrosis) was the most common underlying disease process in this cohort of allograft recipients. Thoracic lymphadenopathy was the most common reason for referral for EBUS-TBNA with 86% (12 of 14) of patients having lymphadenopathy. Parenchymal lung mass was the second most common reason for EBUS referral with 50% (7 of 14) of patients having either a pulmonary mass lesion alone or a mass lesion and associated lymphadenopathy. The most commonly targeted aspiration site was thoracic station 4R (right lower paratracheal location). The 4R location was fine-needle aspirated in 50% (7 of 14) of the patients. In addition to various thoracic lymph node stations, 21.4% (3 of 14) of patients also had parenchymal lung lesions sampled by radial probe EBUS. All biopsies were performed with rapid on site evaluation provided by a cytopathology professional staff physician. The EBUS-TBNA procedures from all 14 patients resulted in adequate diagnostic material with 71.4% (10 of 14) confirming malignancy and with the majority of the malignant cases, 70% (7 of 10), being diagnosed as non-small cell carcinomas. (Adequacy criteria were set by individual pathologists based on experience and with cognizance of available literature.)[7,9,10] Table 1 provides a detailed synopsis of relevant information from the group of previously transplanted patients. Cell blocks were prepared in all 14 cases and were useful/valuable for diagnosis in 11 of 14 cases (79%). Immunohistochemistry was performed in 4 of 14 cases (29%) including both cases of small cell carcinoma, 1 case of adenocarcinoma, and 1 case of sarcomatoid carcinoma. Molecular triage was performed (successfully) in 1 case of adenocarcinoma. Flow studies were used to confirm the diagnosis of post-transplant lymphoproliferative disorder in 1 case.

Discussion

In recent years, EBUS-TBNA has emerged as a minimally invasive technique for evaluating the mediastinum and staging patients with lung cancer and other