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The utility of bronchial brushings in the modern era of flexible bronchoscopy

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Introduction Bronchoscopic procedures allow for the procurement of cellular material for diagnosis, molecular studies, and staging. Procurement modalities include bronchoalveolar lavage (BAL), bronchial washing (BW), transbronchial ultrasound-guided needle aspiration (TBNA), transbronchial biopsy (TBBX), endobronchial biopsy (EB), and bronchoscopic brushing (BB). These specimens, taken concurrently, often circumvent the need for an open biopsy, and allow for more appropriate and efficient patient management. Although BB is a well-established method for obtaining cytologic material, it often introduces artifacts and may contain abundant material such as benign and/or metaplastic bronchial epithelium, both of which may result in atypical or false-positive diagnoses. We examined the utility of BB specimens at our institution in recent years.

Methods 210 BB specimens were identified at our institution over a 2-year period, allowing for at least a 2-year follow-up period. The diagnoses were compiled and compared against results from simultaneously obtained BAL, BW, TBNA, TBBX, and EB specimens, as well as any follow-up during the subsequent 2- to 4-year period.

Results BB specimens were diagnosed as malignant (n = 44), benign (130), indeterminate (30), and non-diagnostic (6). There were no false-positive diagnoses. There were 6 instances in which malignancy was not definitively diagnosed on a non-BB specimen but definitively diagnosed on BB.

Conclusion BB specimens rarely provide the only diagnostic material during a bronchoscopic procedure, though they possess excellent specificity for malignancy. Indeterminate diagnoses have a positive predictive value of approximately 73%.

Introduction

The advent of flexible bronchoscopy has allowed not only for the direct visualization of gross lesions within the bronchial tree, but also for lung specimens to be procured through various modalities.[1] Suspicious lesions can be sampled using

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a bronchial brush (BB), after which the brush is smeared onto a glass slide or rinsed into a liquid medium. Washing the bronchial tree either directly (bronchial washing [BW]) or flushing the distal airways (bronchoalveolar lavage [BAL]) allows collection of material over a larger surface area. These methods have a higher sensitivity than sputum alone.[2,3] The development of transbronchial fine-needle aspiration (TBNA), endobronchial biopsy, and transbronchial biopsy (TBBX) introduced additional methods for obtaining tissue directly from the lesion. These modalities have the ability to obtain an improved amount and enrichment of tumor cells, with preservation of lesional architecture on tissue biopsy. The location of certain lesions may hinder adequate sampling by these methods, however.

Because several studies have demonstrated increased sensitivity using multiple collection modalities within the same bronchoscopic procedure (eg, TBNA combined with BAL and BB), most procedures often generate multiple specimens, and often include mediastinal lymph node sampling when such nodes are suspicious for malignant involvement.[3-5] Studies have shown that all of these collection modalities have low rates of complication and because BB is also easy to obtain when a lesion is visualized, the use of BB during a bronchoscopic procedure adds only a minimally increased cost to the procedure without putting the patient at an increased risk of an adverse event.[6,7] Nevertheless, because the physical act of brushing cells can result in cytomorphologic distortion,[8,9] and because BB specimens often contain abundant benign and/or metaplastic bronchial lining epithelial cells in the background, BB specimens occasionally are diagnosed as indeterminate even when the other concurrent specimens are negative for malignancy. This may result in a clinician questioning whether a radiologically suspicious lesion was adequately sampled and may subsequently cause the patient to undergo an additional bronchoscopic procedure or even a wedge biopsy taken in the operating room. Such procedures are both time-consuming and costly, and thus indeterminate diagnoses should not be made without careful consideration.

In order to determine the benefit provided to patients by BB specimens as compared with the costs caused by indeterminate diagnoses, we examined bronchoscopic procedures performed at our institution within the last 4 years that included a BB specimen. In particular, we evaluated the rate of indeterminate diagnoses in BB specimens with subsequent patient follow-up, as well as the number of instances in which the BB specimen was diagnostic of malignancy missed by other concurrent collection modalities.

Materials and methods

Specimen identification

Institutional review board approval was obtained to conduct this study with a consent waiver. A total of 210 BB specimens were identified at our institution over a 2-year period, allowing for at least a 2-year follow-up period. The diagnoses were compiled and compared against results from concurrently obtained BAL, BW, TBNA, TBBX, and endobronchial biopsy specimens, as well as any follow-up during the following 2- to 4-year period (Fig. 1). Diagnoses considered atypical or suspicious for malignancy were classified as "indeterminate" for the purposes of this study. In all instances, bronchoscopy was performed to evaluate a mass lesion seen on imaging studies. For concurrent modalities from bronchoscopy procedures, or subsequent follow-up, specimens were only considered if they were taken from the same region as the brushing specimen.

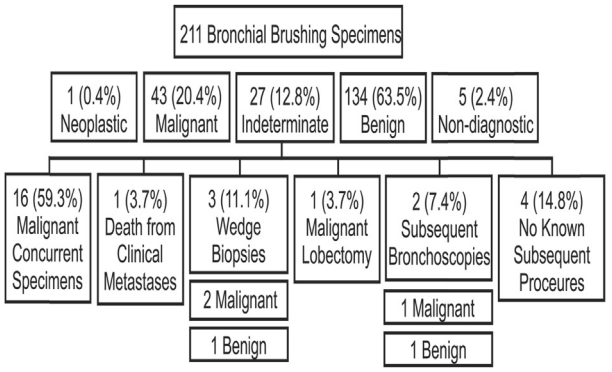

Figure 1 Breakdown of bronchial brushing specimen diagnosis and follow up information.

Specimen preparation

All BB specimens were prepared as conventional smears and stained with a Diff-Quik stain for onsite evaluation with additional preparations stained with the Papanicolaou stain.

Cytopathologists and pulmonologists

The bronchoscopes in this study were all performed by 12 different board-certified pulmonologists on faculty at the Johns Hopkins Hospital, with a range of experience from 10 to 20 years. Over the study period, 9 different board certified cytopathologists were on faculty at the Johns Hopkins Hospital, with a range of experience from 1 to 50 years.

Results

Demographics

The study cohort consisted of 210 specimens from 199 patients; of these, 119 (59%) were male. The average age of the study cohort was 65.0 years (range: 23-89 years). Four (2.0%) patients were Asian, 42 (21.1%) were black, 142 (71.4%) were white, and the remaining 11 (5.5%) were of an unknown or other race.