

## Brief Research

# Utility of Rapid On-Site Evaluation on Endobronchial Ultrasound-Guided Transbronchial Needle Aspirate of the Mediastinal and Hilar Lymph Nodes in Patients with Suspected Sarcoidosis

Vikas Pathak, Mark Richman, Prekchha Jha

### ABSTRACT

**Background** Rapid on-site evaluation (ROSE) is a technique where transbronchial needle aspiration (TBNA) cytology samples are rapidly stained and screened for diagnostic material in the procedure room, during the procedure. We hypothesized the sensitivity of ROSE in patients with sarcoidosis is very low, leading to unjustified use of an expensive technique.

**Data and Methods** This was a retrospective study at an inner-city hospital. Medical records of all patients who underwent EBUS-TBNA of mediastinal and hilar lymph nodes with ROSE over a 3-year period were evaluated. The sensitivity, specificity, and positive and negative predictive values of ROSE in patients with sarcoidosis were calculated, with pathologic diagnosis by cell block as the "gold standard." Patients with malignancy were used as a comparison.

**Results** One hundred eighty-four patients who had ROSE on EBUS-TBNA of mediastinal and hilar lymph nodes were included. Thirty were diagnosed with sarcoidosis, 95 with malignancy, and 59 with benign lymph nodes. The sensitivity of ROSE in patients with sarcoidosis was 44%, specificity and positive predictive value were 100%, and negative predictive value was only 17%.

**Conclusion** Given low sensitivity and negative predictive value, ROSE may not be as useful in diagnosing sarcoidosis as it is in diagnosing malignancy.

**Keywords** Rapid On-Site Cytology, ROSE, sarcoidosis, EBUS-TBNA

### INTRODUCTION

Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is a common method of collecting tissue samples from the mediastinal and hilar regions and from masses adjacent to the trachea and bronchi using ultrasonography to observe and confirm placement of the biopsy needle. EBUS-TBNA is a minimally-invasive method to biopsy lymph nodes or lesions to detect malignancy, inflammatory conditions, infection, or benign conditions. EBUS has been shown to significantly increase the yield of TBNA when compared to conventional (blind) transbronchial needle aspiration.<sup>1</sup>

More recently, rapid on-site evaluation (ROSE) during TBNA has emerged as a method to improve the efficiency of diagnosis without losing diagnostic accuracy. ROSE is a method in which samples are stained and prepared on slides in the procedure room and a lab technician rapidly screens the specimens. In multiple studies, ROSE has been shown to increase the diagnostic yield for patients with malignancy.<sup>2,3,4,5</sup> Further, it has been demonstrated there is a high level of concurrence between the on-site and final evaluation/diagnosis of the samples.<sup>6</sup> EBUS-TBNA with ROSE reduces the need for additional bronchoscopic procedures and is associated with a lower mean puncture number.<sup>7</sup> One benefit of ROSE is having a cytologist determine the quality of the diagnostic material in real time; ROSE was shown to reduce the number of lesions sampled and the number of TBNAs per case, and improved the proportion of samples that yielded a satisfactory cell block.<sup>8</sup> ROSE does add additional costs to the procedure:

staff (technician, pathologist), in-room materials (slides, fixative, stains, microscope).

However, most discussions of EBUS-TBNA with ROSE center around diagnosing malignancy. EBUS-TBNA has a high diagnostic yield in patients with sarcoidosis.<sup>8</sup> However, the additional diagnostic utility of ROSE in patients with sarcoidosis is unclear. This retrospective study focused on the diagnostic yield of ROSE in patients with sarcoidosis to clarify if using such an expensive technique was justified. We hypothesized the sensitivity of ROSE in patients with sarcoidosis is very low, making the use of ROSE unwarranted in patients being evaluated for sarcoidosis.

### MATERIALS AND METHODS

This was a single-center, retrospective study at a level I trauma center in an inner-city hospital. Electronic medical records of 184 patients who underwent EBUS-TBNA with ROSE over a 3-year period were reviewed.

After biopsy aspiration, the EBUS-TBNA needle was handed to the technician, who took the needle to the bedside pathologist. The stylet was used to push aspirated material out of the needle directly onto the slide. Once adequate material was put on the slide, the remainder was added to the cell block. The pathologist smeared the material onto the slide to make it thin, dry it, and dip it in the fixative (methanol) followed by a dip into the stain solution (eosin in phosphate buffer and thiazine dye in phosphate buffer). Once this DiffQuik stain was done, the slide would be dried and cytology assessed at the bedside under microscopy.

The pathologist would inform the bedside assessment to the proceduralist; the remainder of the specimen was taken to the lab with cell block for further assessment.

The sensitivity, specificity, and positive and negative predictive values of ROSE in patients with sarcoidosis were calculated, with pathologic diagnosis by cell block as the "gold standard." Patients with malignancy were used as a comparison. The study was approved by the Institutional Review Board.

## RESULTS

One hundred eighty-four patients who had EBUS-TBNA with ROSE over a 3-year period were evaluated. Thirty were diagnosed with sarcoidosis, 95 patients with malignancy, and 59 with benign lymph nodes. Of the 30 patients with sarcoidosis, 20 (66.7%) were males and 10 (33.3%) were females; the mean age was 47 ( $\pm 11$  years). Nineteen (63.3%) patients were African American, 10 (33.3%) Caucasian, and 1 (3.3%) Asian.

Compared to the final cytology results (via cell block) in patients with suspected sarcoidosis, the sensitivity was 44%, specificity and positive predictive value were 100%, and negative predictive value was only 17%. In comparison, among patients diagnosed with malignancy by cell block, ROSE had sensitivity of 80%, specificity and positive predictive value of 100%, and a negative predictive value of 21%.

## DISCUSSION

Compared to diagnosing malignancy, EBUS-TBNA with ROSE of mediastinal and hilar lymph nodes was much less sensitive in diagnosing sarcoidosis (44%) in this 184-patient retrospective study. The positive predictive value was 100%, indicating a positive ROSE was matched every time by the cell block diagnosis. Specificity was also 100% (every patient without sarcoidosis had a negative ROSE). However, the negative predictive value was only 17%, as many patients with a negative ROSE had sarcoidosis by cell block.

These results contradict those of a 60-patient study that found ~88% sensitivity.<sup>9</sup> However, our results corroborate another prior study that found no benefit to the addition of ROSE to EBUS (sensitivity 84% without ROSE vs. 83% with ROSE). While EBUS with cell block pathology has been shown repeatedly to be a useful diagnostic tool for sarcoidosis,<sup>10</sup> the addition of ROSE to EBUS for immediate diagnosis added little in this study. In contrast, among patients with suspected lung cancer, the agreement rate between ROSE and final cytology is high; one study reported ~86% sensitivity<sup>11</sup> while another reported 94% concordance with final cytological diagnosis.<sup>8</sup>

One limitation of this study was its retrospective design without a control group of similar patients who underwent EBUS-TBNA without ROSE. In the current study, patients who underwent EBUS-TBNA with ROSE may have been systematically different from those who typically undergo EBUS-TBNA without ROSE in such a manner that they were more likely to have false negative biopsies (low sensitivity and low negative predictive value). For example, this study's patients (all had EBUS-TBNA with ROSE) may have had small lymph nodes, which would have

made adequate tissue capture difficult, resulting in more false negative samples and, hence, low sensitivity and low negative predictive value. A randomized, prospective study of patients evaluating the utility of EBUS-TBNA with vs. without ROSE in patients with sarcoidosis could strengthen the conclusion of this study. Further, expanding the study to multiple institutions may allow for the conclusions to be generalized more broadly.

## CONCLUSION

The sensitivity and negative predictive value of ROSE in sarcoidosis were very low in this study. ROSE may not be as useful in diagnosing sarcoidosis as it is in diagnosing malignancy and may increase the cost of the procedure without adding value to the "gold standard" of diagnosis via cell block. Additional studies are needed to definitively determine the role of ROSE as a supplement to EBUS-TBNA in the diagnosis of sarcoidosis.

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#### ABBREVIATIONS

ROSE Rapid On-site Evaluation  
 TBNA Transbronchial Needle Aspiration  
 EBUS Endobronchial Ultrasound-Guided

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