

# The effectiveness of bronchial washings (BW) in the diagnosis of sputum smear for acid fast bacilli (AFB) negative cases of pulmonary tuberculosis

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## Abstract

The first bronchoscopes developed were rigid and used mostly for extraction of foreign bodies. Modifications to the rigid bronchoscope now allow for maintenance of ventilation, improved visualization with the use of optical telescopes and passage of various instruments for diagnostic and therapeutic procedures. All patients attending OPD & in patient at medical college satisfying inclusion & exclusion criteria were taken for the study. Among the 20 patient who were included under the category of sputum negative pulmonary tuberculosis, BW was done in all the patients and a positive microscopic yield in 4 of 20 patients was obtained. Mycobacterial culture was positive in 2 of the 5 patients in whom culture was done, hence a BW fluid total yield of 24% endobronchial biopsy was taken in 4 patients with a positive yield in 1 (25%) patients. Post bronchoscopic sputum for AFB staining was done in half of the patients 10 with a positive yield in the 2 patients (20%).

**Keywords:** EBUS TBNA, conventional bronchoalveolar lavage, mediastinoscopy

## Introduction

The era of bronchoscopy began with Gustav Killian in 1876 when he removed a pork bone from a farmer's airway, using an esophagoscope. Prompted by this accomplishment, Chevalier Jackson, an American otolaryngologist, laid the platform for the modern-day rigid bronchoscope in the early twentieth century. In 1967 Shigeto Ikeda revolutionized the field of bronchoscopy by his innovation of the fiber optic bronchoscope. Today, bronchoscopy and interventional pulmonology have become an integral part of pulmonary medicine and an established subspecialty. Numerous innovators have furthered the horizons of this technology. In the early 1980s Ko-Pen Wang introduced transbronchial needle aspiration to sample mediastinal lesions while Jean-François Dumon developed methods for laser photo resection and for placing stents thorough the bronchoscope. More recently, application of endobronchial ultrasound and electromagnetic navigation tools has further galvanized the role of bronchoscopy. The success of lung transplantation also belongs in part to flexible bronchoscopy. Today, researchers are looking into treating emphysema as well as asthma,

using bronchoscopic techniques <sup>[1]</sup>.

The first bronchoscopes developed were rigid and used mostly for extraction of foreign bodies. Modifications to the rigid bronchoscope now allow for maintenance of ventilation, improved visualization with the use of optical telescopes, and passage of various instruments for diagnostic and therapeutic procedures <sup>[2, 3]</sup>. The major disadvantage of rigid bronchoscopy is the inability to access the upper lobes and airways distal to the segmental orifices. The rigid bronchoscope continues to have many important uses today, although its use has subsided with the introduction of the flexible fiberoptic bronchoscope. The first fiberoptic bronchoscope was developed by Ikeda in 1964 <sup>[4]</sup>.

The properties of fiberoptics enable the bronchoscope to bend and this allows for easy navigation throughout the tracheo-bronchial tree. Flexible bronchoscopy currently plays an important role for diagnosis and treatment in both outpatient and inpatient settings.

The flexible fiberoptic bronchoscope has continued to evolve since its introduction in 1967. Ultra-thin bronchoscopes for the evaluation of small distal airways are now available and have an external diameter of 2.7 mm. Another relatively new development is the video scope that contains a video chip at the distal tip of the bronchoscope. These chips have a lower propensity for damage when compared with fiber bundles and also allow for digital processing of images. A wide variety of ancillary equipment may be used with the flexible fiberoptic bronchoscope, including biopsy forceps, protected and non-protected brushes for cytological and microbiologic studies, and devices for transbronchial needle aspiration. Flexible bronchoscopy is usually performed with local anesthesia and may or may not require conscious sedation. This study aims at analyzing the role of fiber optic bronchoscopy in the patients with sputum smear negative for AFB with various undiagnosed lung lesions in chest x-ray, presenting to our hospital <sup>[5, 6]</sup>.

## **Methodology**

### **Source of data**

The source of data for the study was from the patients attending Department of respiratory medicine, both out patients and in patients.

**Study period:** One year.

**Sample size:** Intended to study a minimum of 50 cases.

**Study design:** Institutional based prospective study.

**Place of study:** All patients attending OPD & in patient at medical college satisfying inclusion & exclusion criteria were taken for the study.

### **Inclusion criteria**

1. Patient consenting for the study.
2. Adult patients aged 18 and above.
3. Suspected patients of PTB (as per RNTCP guidelines).
4. Clinic radiological suspicion of malignancy.
5. Hemoptysis with localizing chest radiograph.
6. Chest x-ray showing non resolving pneumonia.
7. Chest x-ray with undiagnosed lung lesion.

### **Exclusion criteria**

1. Patients not consenting for study.
2. Patients not fitting into inclusion criteria.
3. Patients who is a known or suspected case of HIV infection.

4. Patients with bleeding diathesis.
  5. Patients with history of myocardial infarction, arrhythmias.
  6. Patients on anti-tubercular therapy (ATT) for more than 1 month.
- Post bronchoscopy sputum for smear microscopy for AFB using Ziehl-Neelsen staining method was collected in all patients after bronchoscopy procedure.
  - Relevant specimens were sent for culture of Mycobacterium tuberculosis on Lowenstein-jensen medium & histopathological examination.
  - Relevant specimens were sent for evidence of malignant cells in histopathological examination.

## Results

**Table 1:** Bronchoscopic Findings

Findings	Number	Percent
Normal	8	16%

Sl. No.	Findings	Number	Percent
1.	Foreign body	0	0%
2.	Abnormal anatomy	1	2%
3.	Bleed	3	6%
4.	External compression	6	12%
5.	Structural changes	6	12%
6.	Growth	11	22%
7.	Inflammation	15	30%

Bronchoscopic examination showed vocal cord involvement in 2(4%) of 50 patients studied, of which left cord was involved in 1 (50%) and right cord in 1 patient (50%) inflammatory changes of the endobronchial lumen was the most common finding 15 (30%), followed by Endobronchial growth 11(22%). In 8 patients (16%) bronchoscopic examination did not yield any pathological findings.

Structural changes such as fibrosis, atrophic mucosa, bronchostenosis and distorted anatomy were seen in 6 patients (12%), extra luminal compression was documented in 6 patients (12%). The site of bleed could be identified in 3 (6%) patients abnormal bronchial anatomy was seen in 1 patients (2%), resulting in chronic cough not amenable to medial management. Forceps biopsy, bronchial washings were the procedures done. Almost all procedures were diagnostic. Bronchial washings were the most commonly done procedure.

**Table 2:** Sputum Negative Pulmonary Tuberculosis

Tuberculosis	7/20	35%
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Specimen	Number of patients			Percent
	ZN Stain	MTB-Culture	HPE	
BW	4/20	2/5		24%
Biopsy			¼	25%
PBS	2/10			20%

Among the 20 patient who were included under the category of sputum negative pulmonary tuberculosis, BW was done in all the patients and a positive microscopic yield in 4 of 20 patients was obtained. Mycobacterial culture was positive in 2 of the 5 patients in whom culture was done, hence a BW fluid total yield of 24% endobronchial biopsy was taken in 4

patients with a positive yield in 1 (25%) patients.

Post bronchoscopic sputum for AFB staining was done in half of the patients 10 with a positive yield in the 2 patients (20%).

**Table 3: Malignancy**

Malignancy	15/21	71.42%
<b>Procedure</b>	<b>Positive/total</b>	<b>Percent</b>
BW	9/20	45%
Biopsy	13/15	86.66%

A preliminary diagnosis of malignancy was made in 21 patients, BW was done in 20 of these patients with a positive yield in 9 (45%) of them. Of the 15 patient in whom endobronchial biopsy was taken. 13(86.66%) turned out to be positive for malignancy.

**Table 4: Cell Types**

Cell type	Number	Percent
Squamous	7	46.66%
Undifferentiated	4	26.66%
Adenocarcinoma	3	20%
Others	1	6.66%

Among the 15 patients with definite diagnosis of malignancy, most common cell type in our study was of Squamous Cell Carcinoma occurring in 7(46.66%) of patients. the exact cell type could not be identified in 4 (30.77) patients and were managed in the lines of non-small lung carcinoma. Adenocarcinoma occurred in about 3 (20%) patients and other malignancies occurred in 1 (6.66%) patients.

**Table 5: Complications**

Complication	Total	Percent
Minor hemorrhage	2	4%
Hypoxia	1	2%
Respiratory distress	1	2%
Arrhythmia	0	0
Cardiac arrest	0	0

The complications following bronchoscopic procedure were very few, minor hemorrhage following forceps biopsy was seen in 2(4%) patients, hypoxia requiring postponement of the procedure to a later date occurred in 1(2%) patient and respiratory distress requiring observation following the procedure occurred in 1(2%) patients. however serious complications like arrhythmia and cardiac arrest did not occur in our study group.

**Table 6: Post Bronchoscopy Diagnosis**

Definite positive diagnosis	23	46%
No Specific Diagnosis	27	54%
<b>Post Bronchoscopy diagnosis</b>	<b>Total patients</b>	
Abnormal airway	1	
Pulmonary tuberculosis	7	
Malignancy	15	
Total	23	

Bronchoscopy results in a definitive diagnosis in nearly half of the patients analysed in our study with a positive yield of 46%, as shown in the above table. The most common diagnosis was carcinoma lung as the number of patients evaluated under this group was also high. 7 patients were diagnosed to have pulmonary Koch's and 1 patients had abnormal anatomy resulting in refractory cough.

## Discussion

Vocal cords were involved in 2 of 50(4%) patients in our study. Inflammatory lesions were the most common bronchoscopic findings seen in 15(30%) patients followed by intra luminal growth in 11(22%). However in 8(16%) of bronchoscopies were normal. Structural changes in the form of atrophic mucosa or distorted anatomy or bronchostenosis was seen in 6(12%) & extra luminal compression occurred in 12%, followed by bleeding site, abnormal anatomy & foreign body occurred in 3(6%), 1(2%), 0% patients respectively.

In the study by Sinha *et al.*<sup>[7]</sup> findings were slightly different. The commonest finding in their series was necrotic/nodular growth occurring in 39.1% which is only next to inflammatory changes in our study. In their study left main bronchus was involved in 12%. Extra luminal compression was present in 9.6% (10.85% in our study). However significant number (34.8%) of bronchoscopy was normal in their study compared 17.05% in our study; this can be explained by the fact that we had stringent inclusion criteria and a small sample size.

Forceps biopsy and bronchial washing were the procedures done. Both the procedure was diagnostic. Bronchial washing was the most commonly done procedure.

In sputum smear negative case of pulmonary tuberculosis, the over all diagnostic yield of smear examination and MTB culture from bronchial washing, post bronchoscopy sputum and histopathological studies of forceps biopsy was found to be 35% in our study. The results are comparable with the study by Charoenratanakul S *et al.*<sup>[8]</sup> where 40 patients were studied with an overall diagnostic yield of 47.5% (19/40) and by Yuksekol I *et al.*<sup>[9]</sup> with an overall yield of 48.21%. However an Indian study by Chawla *et al.*<sup>[10]</sup> at Vallabhai Patel institute at New Delhi and had a higher overall diagnostic yield of 61.01%, Willcox PA *et al.*,<sup>[11]</sup> had overall diagnostic yield of 64.7% and Kulpati DDS *et al.*<sup>[12]</sup> reported overall yield of 56%. Hence the overall bronchoscopy yield in the diagnosis of sputum smear negative pulmonary Koch's varies widely from 40% to 70% in literature.

Bronchial washing alone showed evidence of pulmonary Koch's on MTB culture and smear examination in 28% of cases. In an Indian study<sup>[13]</sup> at Vallabhai Patel institute, Delhi, the positive yield of lavage fluid smear for AFB was 20.33% patients, which is similar to our study. In the review of literature a study by Yoksekol I *et al.*<sup>[9]</sup> showed bronchoscopic lavage fluid positive for AFB smear in 23% and 50% positive for culture. RP Baughman, MN Dhon *et al.*<sup>[14]</sup> showed a positive yield in BAL fluid smear examination and MTB culture as 68% and 92% respectively which is much higher than our study. However this was a retrospective study of patients who were subsequently diagnosed to have pulmonary tuberculosis. Willcox PA *et al.*<sup>[11]</sup> in their study showed BAL smear examination positive yield in 63% and culture yield of 38%. Overall positive BAL fluid varies from 20% to 65% in the literature.

In our study the positive yield of bronchoscopic forceps biopsy was 25%. In a study by Charoenratanakul S *et al.*<sup>[8]</sup> a positive yield of TBB was 17.5% and Chawla *et al.*<sup>[10]</sup> showed a positive biopsy yield of 30% which were nearly similar to our study. And they also mentioned that the yield would be higher if smears are prepared from caseous materials whenever visible in the bronchi. However a study by Yuksekol I *et al.*<sup>[9]</sup> showed a much higher yield of 40%.

Positive yield of PBS in our study was 20%. This is comparable to findings by Chawla *et al.*<sup>[10]</sup> have reported 23.73% and Kulpati DDS *et al.*<sup>[12]</sup> who have reported 28% positive post bronchoscopy sputum smear for AFB.

The incidence of various procedures vary in different series. The nature of indications, preference of physicians and the availability of facilities can effect this. In our study washings was the most frequents done procedure, probably because there were predominant inflammatory lesions and external compressions and both these lesions are known to give less diagnostic yield on endobronchial biopsy. Combinations of biopsy and brushing or biopsy and washings are usually done. It is well established that combination increases the yield. The reported yield for various procedures also shows variation. However general trend is that biopsy is most yielding procedure.

### Conclusion

- FOB & related aided in the confirmation of the diagnosis of pulmonary Koch's in 35 of sputum negative cases, which otherwise would have been missed.
- FOB was extremely useful in the diagnosis of malignancy, with forceps biopsy being the most yielding procedure with an overall yield of 86.66%.
- Apart from identifying the site of bleeding in few cases, FOB in patients with hemoptysis & normal chest x ray did not add much to diagnosis.

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