

# Bronchoscopic bronchial brush cytology: an underutilized modality for diagnosing lung cancer in resource-limited facilities: a case series of nine patients

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Key words: bronchoscopy, bronchial brush, lung cancer, bronchial biopsy.

Contributions: AG, concept, study design, review, data collection, data arrangement, writing and analysis; RBA review, editing, and approval. All the authors made a substantive intellectual contribution. All the authors have read and approved the final version of the manuscript and agreed to be held accountable for all aspects of the work.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: none.

Ethics approval and consent to participate: not applicable.

Patient's consent for publication: the patients gave their written consent to use their personal data for the publication of this case report and any accompanying images.

Availability of data and materials: all data generated or analyzed during this study are included in this published article.

Acknowledgments: the authors would like to express their deep thanks to the participants who participated in this study and their bronchoscopy team.

Received: 26 October 2023.

Accepted: 24 January 2024.

Early view: 31 January 2024.

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Chest Disease Reports 2024; 12:12033

doi:10.4081/cdr.2024.12033

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## Abstract

Lung cancer incidence is on the rise with increasing industrialization across the globe. Early diagnosis is the key to a better prognosis. In the current scenario, in developing countries, the majority are diagnosed late, when surgical or curable treatment is not possible, and only palliative treatment options are left. Bronchoscopy is the most widely used modality for the diagnosis of lung cancer. Perhaps, all its accessories are not widely used. Bronchial brush is an easy, cost effective, easily available, without significant complication rates, safe, feasible, with high specificity which offers early preliminary report where biopsy is not possible. It should be used along with biopsy to increase the yield and accuracy in all suspected lung cancer patients who require bronchoscopy.

## Introduction

Lung cancer has the highest mortality among all cancer-related deaths, leading to 1.8 million deaths worldwide. Due to the increased availability of tobacco and industrialization, 2.21 million lung cancer cases were reported in 2020, ranking it as the second most common cancer across the globe.<sup>1,2</sup> Early diagnosis and recent treatment advances have extended the survival of various cancers. Overall, lung cancer-related death rates have declined by 58% from 1990 to 2020 in men but still higher than breast, prostate, colon, and pancreatic cancer.<sup>1</sup> Surgical treatment options are being offered at or below stage IIIA -TNM considering the 5-year survival rates.<sup>3</sup> Hence, early diagnosis is pivotal in decreasing cancer-related mortality. Bronchoscopy-guided and transthoracic image-guided biopsies/FNAC are the most common modalities used for sampling tissue for the diagnosis of lung cancer. The bronchial brush is an easy, cost-effective, easily available accessory which somehow remains underutilized. We will be discussing nine such patients for whom bronchial brush was diagnosed.

## Case Series

Fiberoptic bronchoscopy is the diagnostic modality of choice for lung cancer in various central lesions and for those not accessible by image-guided biopsy or FNAC. As per our institutional protocol, all suspected lung cancer patients are planned for bronchoscopic Bronchoalveolar Lavage (BAL), brush, and biopsy. We will discuss nine patients (*Supplementary Table 1*) in which bronchial brushing was useful for detecting lung cancer early.

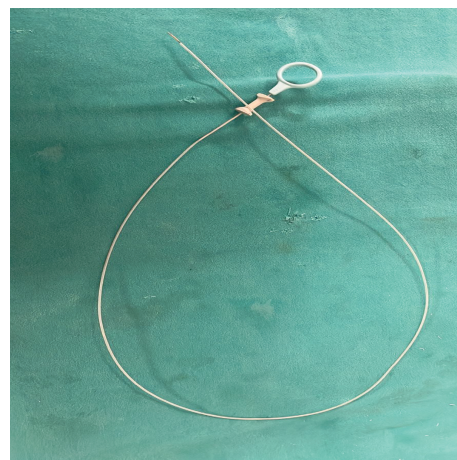
The common complaints of suspected patients were shortness of breath, cough, chest pain, and weight loss. Chest X-Ray (CXR) revealed mass lesion or collapse with underlying mass or pleural effusion in most of them. The majority of them were above 50 years of age and chronic smokers. Contrast-Enhanced Computed Tomography (CECT) chest was done in all patients before plan-

ning bronchoscopy. Consent was taken from all patients before the procedure. As per protocol, nil per oral for 8 hours was a prerequisite. Pre-procedure nebulization with salbutamol, dose was given. Two percent lignocaine gel was put in the nostril, which had more patency. The nasal route was preferred over oral in view of scope bite. From three to five sprays of lignocaine 10% spray were given at the pharyngeal wall. Intravenous access was established before starting the procedure. Oxygen was administered through a nasal cannula to all the patients. Continuous monitoring of blood pressure, heart rate, Electrocardiogram (ECG), and SpO<sub>2</sub> was done. Resuscitation facilities were available in the procedure room. Patients were explained about the procedure in their comfortable and well-understood language. One percent lignocaine was given at the trachea and carina, and sprayed as you go.<sup>4</sup> Normal bronchial tree was examined first and abnormal side later. The visible lesion, if present, was biopsied after taking BAL. The sequence of procedures followed was BAL, brush, biopsy, and post-biopsy washing. The bronchial brush consists of rigid wire covered with plastic tubes and bristles at the end of the wire. The plastic outer sheath protects the brush from contamination. Brushings were taken by back-and-forth movement along with spinning movement over the mucosa. The slide was made with the brush and was fixed in formalin. Two to three brush imprints were made for every patient. In case of bleeding, an injection of tranexamic acid 500 mg was instilled through the scope at the bleeding site. Out of 9, biopsy was deferred in 4 patients due to non-visibility of mass lesion, massive bleeding, or non-cooperation of the patient, whereas brush cytology was positive for malignant cells in all of them. Hence, brush cytology must be performed in all suspected malignancy cases (Figures 1-5).

## Discussion

The first fiberoptic bronchoscope was introduced in 1967.<sup>5</sup> Video bronchoscopes have significantly improved the quality of images with better diagnostic accuracy. Even ultrathin scopes with a <3 mm diameter are available to navigate through distal or narrow airways. Sensitive Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and Positron Emission Tomography (PET) scans have further broadened the indications and improved the accuracy of bronchoscopic samples. Bronchoscopic accessories available have not changed much over the years except cryobiopsy, endobronchial ultrasound, and navigational tools,<sup>6</sup> which may not be available in resource-limited settings. Various samples taken with a bronchoscope include BAL, brush, biopsy, and trans-bronchial needle aspiration where the brush is being underutilized as biopsy is the gold standard, but in suspected lung cancer, it may be very useful and time-saving and lifesaving as well. Various national and international guidelines emphasize the utility of

bronchial brushes.<sup>4,7</sup> A meta-analysis by Cheng Chieh concluded bronchial brush has moderate sensitivity (0.67) and high specificity (0.91) for diagnosing lung cancer. It is much better than bronchial washing and comparable to CT-guided biopsy. It has significantly improved the overall diagnostic yield of bronchoscopy, and although radial endobronchial ultrasounds are preferred over conventional bronchoscopes for bronchial brush,<sup>8</sup> but in resource-limited settings, its role is beyond any doubt. It must be used for early diagnosis, especially in cases where early chemo or radiotherapy treatment is required to manage complications like SVC syndrome or lung collapse. A biopsy report takes 5-7 days on average, which delays treatment and sometimes worsens the prognosis



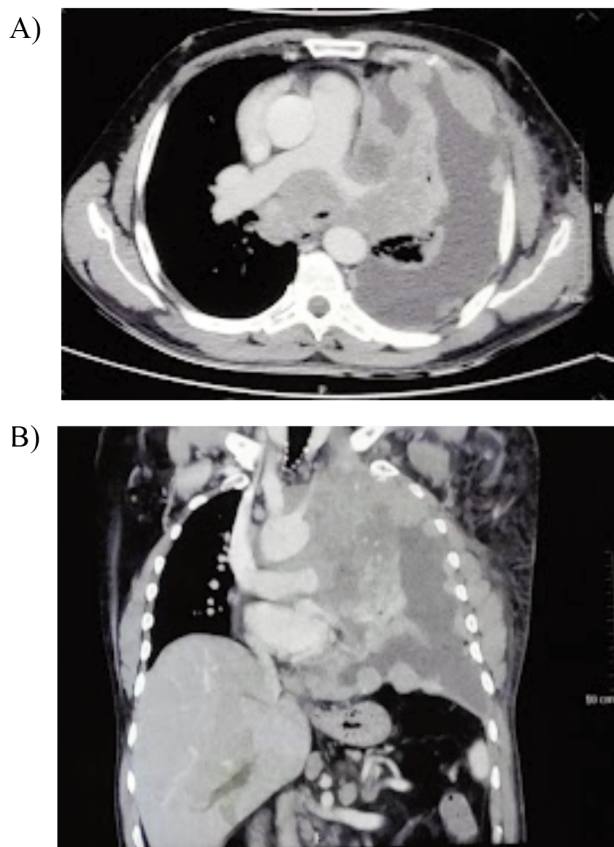
**Figure 1.** Bronchial brush comprises of outer sheath, which covers the brush where the brush has soft bristles at the end.



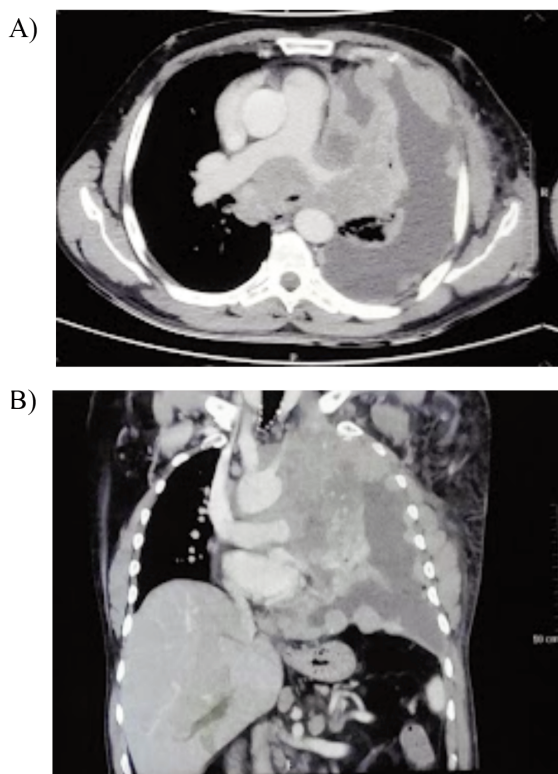
**Figure 2** Closer view of distal end of brush covered with soft fine bristles throughout.

**Table 1.** Pros and cons of bronchial brush over biopsy.

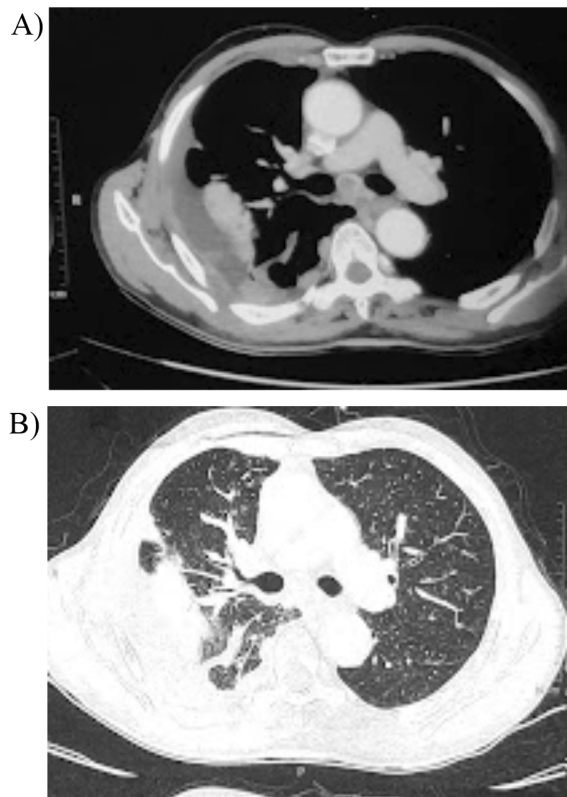
Pros	Cons
1. Feasible option where biopsy is not possible (e.g., uncooperative patient, no visible lesion/collapse/ external compression)	1. IHC markers not possible
2. Less risk of bleeding as compared to biopsy	2. Not the gold standard
3. Early result within 24 hours	3. Low sensitivity
4. Require less expertise	4. Tumor phenotyping may not be possible sometimes
5. Good yield	
6. High specificity	



**Figure 3.** Case 1. Left hilar mass with left pleural effusion.



**Figure 4.** Case 6. Left massive pleural effusion with collapse.



**Figure 5.** Case 7. Right pleural effusion with pleural deposit and lower lobe segmental collapse.

as well. Brush must be taken along with a biopsy in all suspected lung cancer patients. It enhances the yield and reconfirms the diagnosis.

The benefits of brushing include an early report in 24 hours, which saves time; early treatment and prognostication can be offered; double confirmation at low cost; a feasible option where biopsy is not possible; and lesser complication rates (Table 1).

## Conclusions

A biopsy is the gold standard diagnostic investigation and is always superior to a bronchial brush, but the combination of both saves time, makes an early diagnosis, and avoids repeat diagnostic procedures in case the biopsy is negative.

## References

1. Thandra KC, Barsouk A, Saginala K, et al. Epidemiology of lung cancer. *Contemp Oncol (Pozn)*. 2021;25:45-52.
2. World Health Organization (WHO). Facts Sheets: Cancer. Available from: <https://www.who.int/news-room/factsheets/detail/cancer>
3. NCCN clinical practice guidelines in oncology. Non-small cell lung cancer. Available from: [https://www.nccn.org/guidelines/category\\_1](https://www.nccn.org/guidelines/category_1)
4. Mohan A, Madan K, Hadda V, et al. Guidelines for diagnostic flexible bronchoscopy in adults: Joint Indian Chest Society/National College of Chest Physicians (I)/Indian Association for Bronchology Recommendations. *Lung India*.

- 2019;36:S37-89.
5. Panchabhai TS, Mehta AC. Historical perspectives of bronchoscopy. Connecting the dots. *Ann Am Thorac Soc*. 2015;12:631-41.
  6. Mondoni M, Rinaldo RF, Carlucci P, et al. Bronchoscopic sampling techniques in the era of technological bronchoscopy. *Pulmonology*. 2022;28:461-71.
  7. Du Rand IA, Blaikley J, Booton R et al. British Thoracic Society guideline for diagnostic flexible bronchoscopy in adults: accredited by NICE. *Thorax*. 2013;68:i1-44.
  8. Chen CC, Bai CH, Lee KY, et al. Evaluation of the diagnostic accuracy of bronchial brushing cytology in lung cancer: a meta-analysis. *Cancer Cytopathol*. 2021;129:739-49.
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Online supplementary materials

Supplementary Table 1. Case description of 9 cases of lung cancer diagnosed with bronchial brush cytology.