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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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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 increased availability of tobacco and industrialization, 2.21 million lung cancer cases were reported in 2020, ranking it as second most common cancer across the globe.[1,2] Early diagnosis and recent treatment advances have extended 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.[1] Surgical treatment options are being offered at or below stage IIIA -TNM considering the 5-year survival rates.[3] Hence, early diagnosis is pivotal in decreasing the 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. Bronchial brush is an easy, cost effective, easily available accessory which somehow remains underutilized. We will be discussing 9 such patients in whom bronchial brush was diagnostic.

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 such suspected lung cancer patients are planned for bronchoscopic Bronchoalveolar Lavage (BAL), brush and biopsy. We will here be discussing 9 patients (Table 1) in whom bronchial brush was useful in detecting lung cancer early.

Shortness of breath, cough, chest pain and weight loss were the common complaints of suspected patients. Chest X-Ray (CXR) revealed mass lesion or collapse with underlying mass

or pleural effusion in most of them. Majority of them were above 50 years of age and chronic smokers. Contrast-Enhanced Computed Tomography (CECT) chest was done in all patients before planning bronchoscopy. Consent was taken from all patients before 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. Nasal route was preferred over oral in view of scope bite. From three to five sprays of lignocaine 10% spray were given at pharyngeal wall. Intravenous access was established before starting the procedure. Oxygen was administered through nasal cannula to all the patients. Continuous monitoring of blood pressure, heart rate, Electrocardiogram (ECG) and SpO_2 was done. Resuscitation facilities were available in the procedure room. Patients were explained about the procedure in there comfortable and well understood language. One percent lignocaine was given at trachea, carina and spray as you go.[4] Normal bronchial tree was examined first and abnormal side later. Visible lesion if present was biopsied after taking BAL. The sequence of procedure followed was BAL, brush, biopsy, post biopsy washing. Bronchial brush consists of rigid wire covered with plastic tube and bristles at the end of the wire. Plastic outer sheath protects the brush from contamination. Brushings were taken by back and forth movement along with spinning movement over the mucosa. Slide was made with the brush and were fixed in formalin. Two-three brush imprints were made for every patient. In case of bleeding, injection 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

First fiberoptic bronchoscope was introduced in 1967.[5] Video bronchoscopes have significantly improved quality of image with better diagnostic accuracy. Even ultrathin scopes with <3mm 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 accuracy of bronchoscopic samples. Bronchoscopic accessories available have not changed much over years except cryobiopsy, endobronchial ultrasound and navigational tools[6] which may not be available at resource limited settings. Various samples taken with bronchoscope includes BAL, brush, biopsy, transbronchial needle aspiration where 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 on utility of bronchial brush.[4,7] A metanalysis 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 overall diagnostic yield of bronchoscopy although radial endobronchial ultrasounds are preferred over conventional bronchoscope for bronchial brush[8] but in resource limited settings its role 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. Biopsy

report takes 5-7 days on an average and which delays treatment and sometimes worsens the prognosis as well. Brush must be taken along with biopsy in all suspected lung cancer patients. It enhances the yield and reconfirms the diagnosis.

Benefits of brush includes early report in 24 hours mostly, saves time, early treatment and prognostication can be offered, less cost, double confirmation at low cost, feasible option where biopsy is not possible, lesser complication rates (Table 2).

C**onclusion**s

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

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

Pt No.	Age(years) /sex	Symptoms with duration (months)	Smoker	CXR	CT Chest	FOB finding	BAL	Brush	Biopsy	Complication	Final diagnosis
1	40/M	SOB, chest pain, weight loss for 1 month	yes	LLZ mass	L hilar mass with L PE	LLL bronchus narrowed along with irregular mucosa	neg	**Atypical cells**	Not attempted as no visible mass lesion	None	Bronchogenic carcinoma(not specified)
2	60/M	SOB, hemoptysis, weight loss for 1 month	yes	RLL collapse	R hilar mass	R main bronchus growth	neg	**Adenocarcinoma**	neg	Massive Bleeding , resolved later.	Adenocarcinoma
3	61/F	SOB, cough, weight loss for 1 month	yes	LLZ opacity	LLL mass	L main bronchus growth	neg	**Squamous cell carcino-ma**	Biopsy not attempted as patient uncooperat-ive and hemodyna-mically unstable.	None	Squamous cell carcinoma
4	50/M	Cough, SOB, chest pain for 15 days	yes	Left hilar mass	L hilar mass	L main bronchus growth	neg	Small cell carcino-ma	**Small cell carcinoma**	None	Small cell carcinoma
5	60/M	SOB, hemoptysis for 15 days	yes	Mediastinal widening	Mass lesion extending	R main bronchus growth	neg	Adeno carcino-ma	Squamous cell carcinoma	None	Squamous cell carcinoma(?) on MDD*

					from R paratra-cheal region to hila.						
6	50/M	SOB, weight loss for 1 month	yes	L massive PE without mediastinal shift	LUL mass with moderate PE and pleural deposits.	L main bronchus infiteration and narrowing	neg	Poorly differentiated carcinoma	**Small cell carcinoma**	None	Small cell carcinoma
7	65/M	SOB, chest pain, cough for 30 days	no	R PE	R PE with large pleural deposits and RLL collapse along with mediasti-nal LAP	Normal	Neg	**Adeno**carcinoma	Not attempted Pleural fluid is neg for malignant cells.	None	Adenocarcinoma
8	55/M	Hoarsness of voice and weight loss for 2 months	yes	Rounded opacities in bilateral lung fields	LLL mass with multiple bilateral random nodules, adrenal metasta-	L main bronchus infilterated, L vocal cord palsy.	Atypical cells	**Squamous** carcino-ma	Non-small cell carcinoma	None	Squamous cell carcinoma

					sis with mediastinal LAP						
9	53/M	Hemoptysis, SOB, weight loss for 8 months	yes	RLL collapse	RLL mass (6*6.6 cm) along with collapse of RLL,RML, mediasti-nal LAP, minimal pericarp-dial and moderate PE	R bronchus interme-dius compres-sed externally	neg	**Squamous** carcino-ma	Not attempted due to massive bleeding	Massive bleeding	Squamous cell carcinoma

Diagnostic tests are bold. Abbreviations: CXR- chest x ray, BAL- bronchoalveolar lavage, FOB- fiberoptic bronchoscope, SOB- shortness of breath, LOA- loss of appetite, WL-weight loss, L-left, R-right, UL- upper lobe, LL- lower lobe, PE- pleural effusion, MDD- multidisciplinary discussion*MDD meeting was held between radiologist, pathologist and pulmonologist where after detailed discussion of the case, it was concluded as squamous cell carcinoma. Biopsy remains the gold standard.

Table 2. Pros and cons of bronchial brush over biopsy.

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

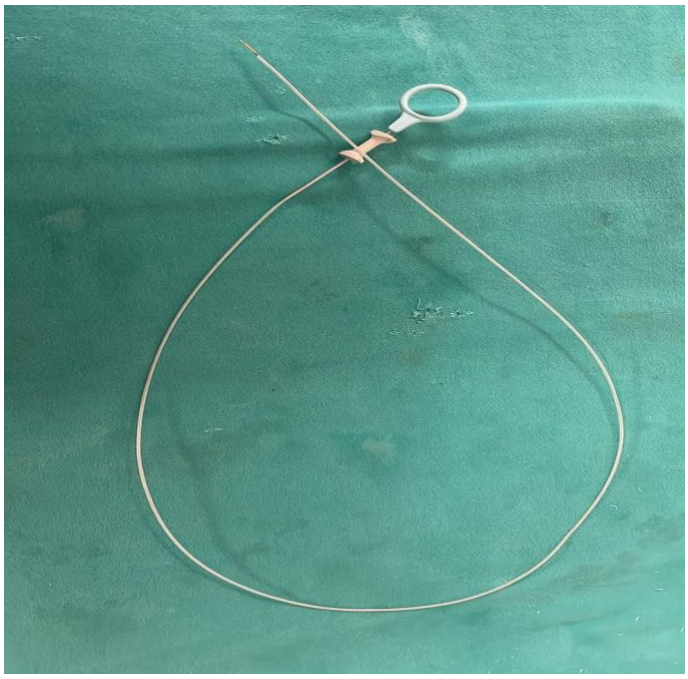


Figure 1. Bronchial brush comprises of outer sheath, which covers the brush where the brush has soft bristles at the end.

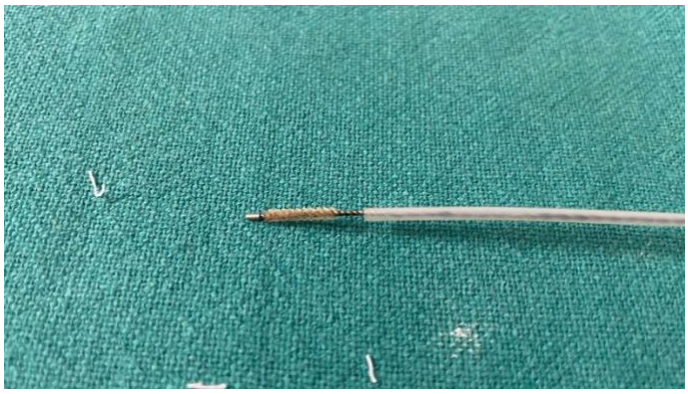
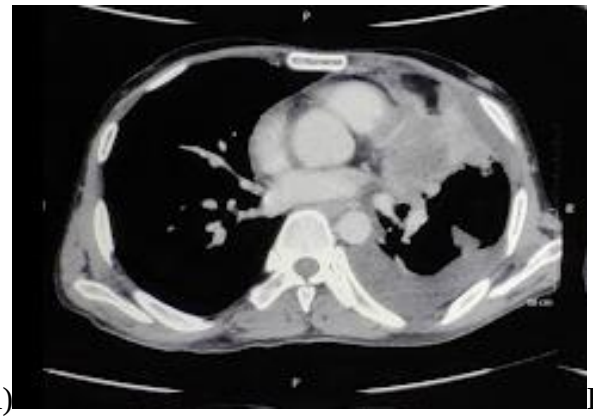


Figure 2. Closer view of distal end of brush covered with soft fine bristles throughout.

A)  B)

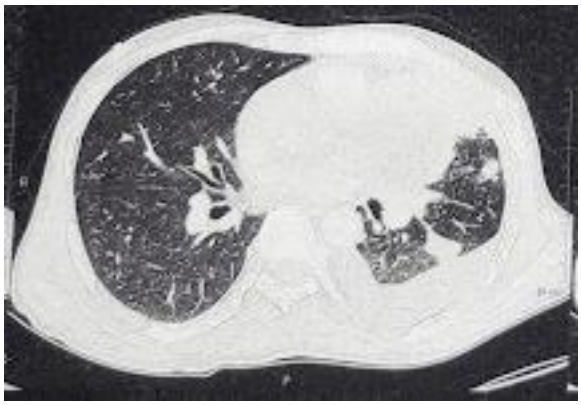


Figure 3. Case 1. Left hilar mass with left pleural effusion.

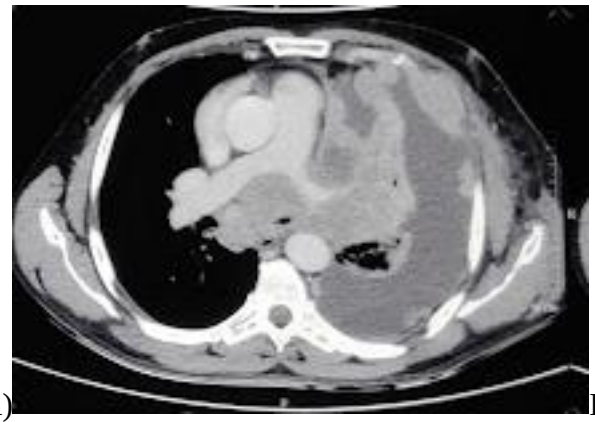
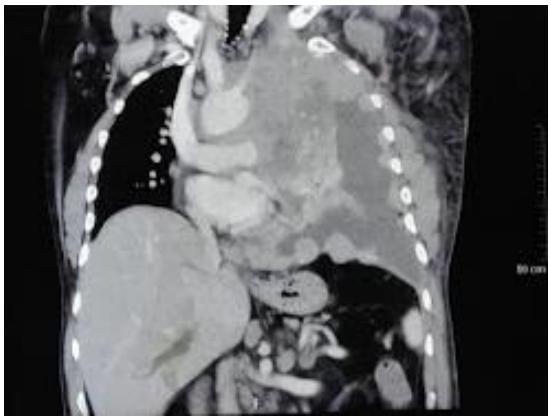
A)  B) 

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

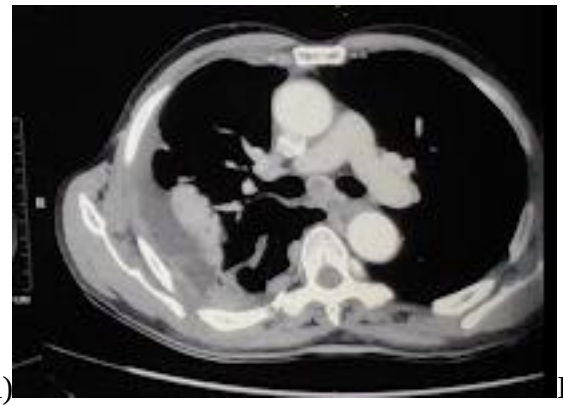
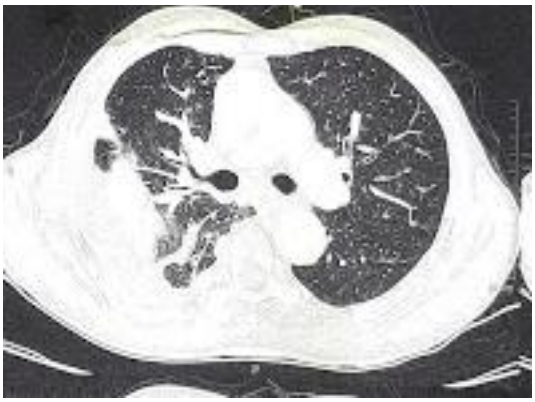
A)  B) 

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