SENSITIVITY OF BRONCHIAL BIOPSY VERSUS BRONCHIAL WASHINGS AND BRUSHINGS IN CASES OF COLLAPSE

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ABSTRACT

BACKGROUND

Collapse also known as atelectasis is defined as decrease in volume or a portion of lung. Collapse is not a disease, but an important sign that results from disease or abnormalities in the lung. The major causes of collapse of lung include lung cancer, endobronchial TB, endobronchial metastasis, infection, bronchiectasis, foreign body, mucous plugging etc. Therefore, it is necessary to use diagnostic tools such as fiberoptic bronchoscopy to get an accurate diagnosis of underlying cause in a patient presenting with collapse on chest radiograph or CT chest. In general, the concordance between cytology and histopathology ranges from 70% to 90% and the bronchial biopsy is confirmatory for most of the cytological findings. An attempt has been made to determine the sensitivity of bronchial biopsy vs. bronchial washings and brushings in cases of collapse.

The current study was planned with an objective of assessing the correlation of cytology of bronchial brushing and washings with histopathology of bronchial biopsy.

The present study is an institutional based prospective study conducted on 30 patients presenting with collapse of lung to evaluate sensitivity of bronchial washings and brushings with biopsy.

MATERIALS AND METHODS

In this observational, descriptive, cross-sectional study all patients referred (during study period) for pulmonary consultation for suspected lung collapse were considered for fiberoptic bronchoscopy and the appropriate samples were sent for washings, brushings and biopsy.

RESULTS

Out of 30 patients of collapse of lung, aetiological diagnosis was known by FOB in 29 patients (96.66%) and unknown in 1 patient (3.33%). The diagnostic rate of FOB is 96.66%. Malignancy is the most common cause of collapse in the present study, 17 patients had malignancy (56.66%) followed by tuberculosis in 10 patients (33.33%) and foreign body in 2 patients (6.66%). The aetiology could not be made out with bronchoscopy in 1 case (3.33%). The major cause of collapse in young patents (< 40 yrs.) is non-malignant causes like tuberculosis (75%). The major cause of collapse in middle-aged and old-aged patients is malignancy (88.88%). Foreign body is the cause of collapse in two patients, both < 10 yrs. of age. In the present study, in all 30 patients, bronchial biopsy, brushings and bronchial washings were taken. In 29 patients (96.66%), aetiological diagnosis was made. Among the 17 patients diagnosed by FOB as malignancy 17 patients (100%) had positive result with bronchial biopsy, 14 patients had positive results with bronchial brushings (82.35%), whereas only 8 patients (47.05%) had positive result with bronchial washings. The yield with bronchoscopic biopsy is better than bronchial brushings and bronchoscopic washings in the diagnosis of malignancy presenting with collapse of lung. Among the 10 patients diagnosed by FOB as endobronchial tuberculosis all 10 patients (100%) had positive result with bronchial washings, 7 patients (70%) had positive result with bronchial brushings, 4 patients had positive results with bronchial biopsy.

CONCLUSION

The yield with bronchoscopic washings is better than brushings and biopsy in the diagnosis of endobronchial tuberculosis presenting with collapse of lung.

KEY WORDS

Diagnostic Yield of Fiberoptic Bronchoscopy, Diagnostic Yield of Washings, Brushings and Biopsy, Sensitivity of Bronchial Biopsy, Brushings and Washings.

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BACKGROUND

Collapse also known as atelectasis is defined as decrease in volume or a portion of lung. Collapse is not a disease, but an important sign that results from disease or abnormalities in the lung.¹ The major causes of collapse of lung include lung cancer, endobronchial TB, endobronchial metastasis, infection, bronchiectasis, foreign body, mucous plugging etc.

Therefore, it is necessary to use diagnostic tools such as fiberoptic bronchoscopy to get an accurate diagnosis of

underlying cause in a patient presenting with collapse on chest radiograph or CT chest.² The earliest manifestation of tumours that arise in the proximal airways is frequently the result of airway obstruction rather than the tumours themselves. The most frequent of these findings include collapse, bronchiectasis with mucus plugging and consolidation. Bronchial biopsies and brush samples can be taken for pathological examination and a direct assessment can be made of operability as judged by the proximity of central tumours to the main carina.³ 25 - 35% of endobronchial tuberculosis patients present as collapse on chest radiograph,⁴ where FOB is important in diagnosis. Fibreoptic bronchoscopic examination should be done to know the aetiological cause of collapse of lung at an earlier stage. The advantage of making early diagnosis of aetiological cause of collapse of lung prevents the morbidity and progression of the underlying disease.

Cytology is an accurate, economical and rapid technique that can be useful in diagnosing a large number of non-neoplastic and neoplastic pulmonary lesions. Proper sampling, procurement of high quality specimens, adequate specimen preparation, careful examination of material and correlation with clinical and radiographic features are essential for accurate diagnosis.⁵ When biopsy is difficult in certain anatomical location of the lesions and in haemorrhagic disorders, brushing cytology can be considered as an effective tool to diagnose the condition as it covers wider area (2 cm) compared to less than 5 mm by forceps and it is easy to obtain brushing cytology sample.⁶ Imprint smears from bronchial biopsy has also been found to give a good diagnostic yield.⁷ Better diagnostic yield is often obtained when cytologic techniques are used together with bronchial biopsy.⁸

In general, the concordance between cytology and histopathology ranges from 70% to 90% and the bronchial biopsy is confirmatory for most of the cytological findings.⁹ Bronchoscopy followed by brushing, washings and biopsy in clinically and radiologically suspected collapse cases is the main diagnostic procedure in our context. An attempt has been made to determine the sensitivity of bronchial biopsy vs. bronchial washings and brushings in cases of collapse. The current study was planned with the objective of assessing the correlation of cytology of bronchial brushing and washings with histopathology of bronchial biopsy.

MATERIALS AND METHODS

In this descriptive study, all patients referred (during study period) for pulmonary consultation for suspected lung collapse were considered for fibreoptic bronchoscopy. The patients with radiological lesion (Chest x-ray) suggestive of collapse with direct signs like displacement of interlobar fissures, crowding of vessels and bronchi and indirect signs like local increase in opacity, elevation of hemidiaphragm, displacement of mediastinum, compensatory overinflation, displacement of the hila, approximation of ribs, absence of air bronchogram (In cases of resorption collapse only), absence of visibility of interlobar artery (In cases of lower lobe atelectasis only) are included in the study.

Patients with known lung cancer, recent myocardial infarction, blood dyscrasias, known case of pulmonary tuberculosis, patients having poor general condition, positive test result for HIV infection and unwilling patient were excluded from the study.

Technique of Bronchoscopy

After obtaining well-informed written consent, all the bronchoscopies were performed as an elective procedure. Food and drinks were withheld at least 6 hours prior to Bronchoscopy.

Pre-bronchoscopy screening was done with history, physical examination, BT, CT, PT, platelet count, fresh x-ray chest PA and lateral views and ECG, sputum smear for AFB on three consecutive days and xylocaine sensitivity test.

Initially, anaesthesia was achieved by nebulising the patients with 2 mL of 4% lidocaine in sitting posture just before bronchoscopic examination. 4% lidocaine was used as spray with an atomizer over the oropharynx before the bronchoscopy.¹⁰ Total dose of lidocaine never exceeded 400 mg in all patients. The effect lasted for 30 - 60 minutes. Because of potential hazards of topical agents, oxygen, good suction and injectable anticonvulsant agents and shock reviving equipment were made available during procedure.

All bronchoscopies were performed by a single operator and were done with the patient lying supine on the operation table with the operator standing at the head end. Transnasal passage was used for bronchoscopy. Thorough examination of nasopharynx and larynx was done. Nasal passage functions as a stint for the passage of flexible fibreoptic bronchoscope, permitting leisurely inspection of upper airways and observation of the glottis and trachea under dynamic or static conditions. The brush and biopsy instrument are withdrawn through internal channel. The same fibreoptic bronchoscope - Olympus BF type TE2 bronchoscope was used throughout the study.

Collection and Handling of Tissue Sampling Materials

The radiologically normal side was examined first, after that the diseased side. Whenever intrabronchial growth was seen bronchial brushing, washings and biopsy were done in sequence. Brushings were taken first in each case as the trauma and bleed is minimal.

Bronchial Brushings

Bronchial brushings will be obtained by the use of a stiff-bristle disposable brush. The contents of brush was spread on glass slides and immediately fixed in methanol. In suspected cases of tuberculosis, dry slide is sent for smear examination of AFB.

Bronchial Washings

Bronchial washings was done with about 10 - 15 mL of 0.9% sterile saline (instilled with a syringe) and by application of 50-80 mmHg negative pressure from a suction apparatus and the fluid was collected into 75 mL disposable sterile specimen traps. Bronchial washings were also sent for AFB examination.

Bronchial Biopsy

Forceps was placed on the mass or lesion and pressed timely into it before closing the cups and after closing. Forceps was withdrawn into the scope. The site was washed between biopsy with normal saline to avoid the biopsy of overlying clotted blood. Three to five bronchial biopsies from each lesion will be taken using a standard cup forceps, unless limited by patient tolerability of procedure or complications such as bleeding. Biopsy samples are immediately fixed in 10% formalin solution and routinely processed for

histopathology using haematoxylin and eosin. The entire procedure took 10 - 15 minutes. Following the procedure, the patient was carefully observed for 4 hours and watched for haemoptysis and other complication. After bronchoscopy, the patients rested for 2 hours to allow the local anaesthesia to wear off. They were then allowed to eat and drink.

Statistical Analysis

As the study is a descriptive study here, categorical data is represented as proportions and quantitative data as mean and standard deviations and data will be analysed using Excel sheets. This data is used to calculate sensitivity of bronchial biopsy vs bronchial brushings and bronchial washings in case of collapse.

RESULTS

A total of 30 patients with radiographic evidence of lung collapse underwent the diagnostic procedures during this period. Age of patients ranged from 2 yrs. to 70 yrs. with mean age of 50 yrs. Most of the patients were in the group of 60-80 yrs. (36.6%), 18 (60%) were male and 12 (40%) were female.

Etiological diagnosis	Number of patients	Percentage (%)
Malignancy	17	56.66%
Tuberculosis	10	33.33%
Foreignbody	2	6.66%
Inconclusive	1	3.33%

Table 1. Shows overall Aetiological Diagnosis of Collapse on Bronchoscopy in terms of different Tissue Sampling Techniques

Aetiological Diagnosis Number of Patients Percentage

Among the 30 patients studied aetiological diagnosis was known in 29 patients (96.66%), malignancy was diagnosed in 17 patients (56.66%), endobronchial tuberculosis in 10 patients (33.4%), foreign body causing collapse in 2 patients (6.66%) and diagnosis remained unknown in 1 patient (3.33%). The diagnostic rate of FOB is 96.66%.

The sensitivity of FOB specimen in malignancy through bronchial washings was 44.44%, bronchial brushings was 77.77% and through bronchial biopsy was 94.44%.

Fob specimen	True positive	True negative	False positive	False negative
Washings	8	10	-	10
Brushings	14	10	-	4
biopsy	17	10	-	1

Table 2

The sensitivity of fob specimen in tuberculosis through bronchial washings was 100%, bronchial brushings was 70% and through bronchial biopsy was 40%.

Fob specimen	True positives	True negatives	False positives	False negatives
Washings	10	18	-	-
Brushings	7	18	-	3
Biopsy	4	18	-	6

Table 3

Yield of 3 Procedures in TB and Malignancy

The diagnostic yield of bronchial washings in tuberculosis is 100% and in malignancy is 47.05%. The diagnostic yield of bronchial brushings in tuberculosis is 70%, in malignancy is 82.35%. The diagnostic yield of bronchial biopsy in tuberculosis is 40%, in malignancy is 100%.

Figure 1

The diagnostic yield of bronchial washings in combined benign and malignant lesions is 78.57%. Brushings have 85.7% and biopsy has 75% yield.

diagnosis	No of patients	Percentage
Total	28	96.66%
With bronchial washings	22	78.57%
With bronchial brushings	24	85.7%
With bronchial biopsy	21	75%

Table 4. No. of Patient's Percentage

DISCUSSION

Bronchoscopic aided cytological sampling is useful in the evaluation of various lesions of lung. Bronchoscopy and guided techniques play a definitive role in the diagnosis of endobronchial lesions. Bronchoscopy provides direct visualisation of the airways and permits focused sampling of the lesion with high yield of cells/ tissue. Bronchial brushings are obtained by a brush sample from the surface of the tumour under direct visualisation.¹¹

There is still disagreement as to the value and reliability of wash and brush cytology in comparison with histology for the diagnosis of malignancy at flexible bronchoscopy. Histological or cytological confirmation is known to be associated with a higher rate of specific oncology treatment for lung cancer patients.¹² Some authors suggest cytology does not add to the diagnostic yield from biopsy for endobronchial tumours,¹³ whilst others consider the two modalities as complementary.^{14,15} The present study compares the yield from the three modalities in cases presenting with collapse.

The present study is an institutional based prospective study conducted on 30 patients presenting with collapse of lung to evaluate sensitivity of bronchial washings and brushings with biopsy.

Out of 30 patients of collapse of lung, aetiological diagnosis was known by FOB in 29 patients (96.66%) and unknown in 1 patient (3.33%). The diagnostic rate of FOB is 96.66%. Malignancy is the most common cause of collapse in the present study, 17 patients had malignancy (56.66%) followed by tuberculosis in 10 patients (33.33%), foreign body in 2 patients (6.66%). The aetiology could not be made

out with bronchoscopy in 1 case (3.33%). This is on par with studies conducted by Yan Zhi-Jun et al¹⁶ 62.7%, Qiao Hua et al¹⁷ 61.1%.

In the present study, the major cause of collapse in young patents (< 40 yrs.) is non-malignant causes like tuberculosis (75%). This finding is similar with the following studies Luo Li-Ming et al¹⁸ and Chen Yuan et al.¹⁹ The major cause of collapse in middle-aged and old-aged patients is malignancy (88.88%). Foreign body is the cause of collapse in two patients, both aging < 10 yrs.

Among the 17 patients diagnosed by FOB as malignancy 17 patients (100%) had positive result with bronchial biopsy, 14 patients had positive results with bronchial brushings (82.35%), whereas only 8 patients (47.05%) had positive result with bronchial washings. The yield with bronchoscopic biopsy is better than bronchial brushings and bronchoscopic washings in the diagnosis of malignancy presenting with collapse of lung. The sensitivity of bronchial brushings in diagnosing malignancies is 77.74%. The sensitivity of bronchial biopsy is 94.44%. The study concludes bronchial brushings can reliably diagnose malignancies, though the sensitivity of bronchial biopsy is high. It is on par with study done by Tang Yuying et al (94%). The majority of the malignancy cases were diagnosed with bronchoscopic biopsy.²⁰ Dr. Bhavana Garg et al, Brushings showed a sensitivity of 88.2% for the diagnosis of neoplasms. On the other hand, washings had only a 34.9% sensitivity in diagnosing neoplastic disorders. They concluded that bronchial brushings can very reliably diagnose neoplastic diseases.²¹ Paul A Kvale et al, in their study concluded that in endoscopically visible carcinomas brushings (77%) and forceps biopsy (71%) yielded the highest percentage positive specimens.²²

Among the 10 patients diagnosed by FOB as endobronchial tuberculosis, all 10 patients (100%) had positive result with bronchial washings, 7 patients (70%) had positive result with bronchial brushings and 4 patients had positive results with bronchial biopsy. The yield with bronchoscopic washings is better than brushings and biopsy in the diagnosis of endobronchial tuberculosis presenting with collapse of lung. The lower sensitivity of bronchial biopsy is due to presence of endobronchial narrowing. 8 out of 10 tuberculosis cases presented with narrowing where biopsy is not feasible. Li Yuanyuan et al²³ investigated the causes and bronchoscopic features of collapse of lung. Tracheal cavity scar strictures or closure were often seen in tuberculosis (80.6%). In such conditions where biopsy is not feasible, bronchial washings can be used as an alternative to biopsy for diagnosing endobronchial tuberculosis. This is on par with other studies.

CONCLUSION

Fibreoptic bronchoscopy is an important modality to diagnose the aetiological cause in a patient presenting with collapse of lung/lobe on chest x-ray or CT-chest. In the present study, FOB led to diagnosis in 96.66% patients. Most common cause of collapse in > 40 yrs. of age was malignancy (88.88%) and in <40 yrs. of age was tuberculosis (75%). Sensitivity of bronchial biopsy in diagnosing malignancy is 94.44%. Sensitivity of bronchial washings in diagnosing tuberculosis is 100%. Bronchial brushings can be used as a single modality in the diagnosis of aetiology of collapse when

biopsy is not feasible as in cases with hypoxemia, highly vascular tumour or in uncooperative patients. However, large scale studies are needed to further define the role of this modality in patients presenting with collapse of lung.

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