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Original Research Article

Does a routine post brush bronchial wash increase the yield in diagnosis of lung cancer?

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ABSTRACT

Background: Lung cancer is the most common cause of cancer-related death in both men and women. 80% of the lung cancers are non-small cell lung cancer (NSCLC) and 20% are small cell lung cancer (SCLC). Flexible fiberoptic bronchoscopy is commonly used for diagnostic and staging purposes. Endoscopically visible abnormalities are approached with traditional biopsy forceps, brushings, and washings. Objectives were to assess the yield of bronchial washings, brush cytology and to compare the yield of pre and post brush bronchial washings.
Methods: Patients with suspicion of lung cancer will be subjected to bronchoscopy using flexible fibreoptic bronchoscopy. Multiple procedures performed for the retrieval of tissue samples will include bronchial washings (pre and post brushing), bronchial brushing and endobronchial biopsy.
Results: A total of 57 cases were included in the study with 40 (70.2%) males and 17 females (29.8%). The yield of pre-brush bronchial washings, post brush bronchial washings and bronchial brushings were 31.6% (18 of 57), 31.6% (18 of 57) and 61.4% (35 of 57) respectively. Biopsy was positive for malignancy in 11 of 19 (58.2%) cases. Adenocarcinoma was the commonest type seen in 32 (56.1%) patients. Of the 27 cases with endobronchial growth 11 were adenocarcinoma (40.7%).
Conclusions: There was no difference between the yield of pre-brush washing and post brush washing. The yield of brush cytology was significantly more than the yield of bronchial washings. There is an increase in the yield after adding both pre and post brush bronchial wash.

Keywords: Adenocarcinoma, Bronchial brushing, Bronchial washings, Endobronchial biopsy, Flexible fiberoptic bronchoscopy

INTRODUCTION

A rare disease at its start, by the end of twentieth century lung cancer had become one of the world's leading causes of preventable death accounting for roughly one third of all cancer deaths.[1] It is important to perform timely and accurate tissue diagnosis so that the patient may be referred for appropriate multi-modality treatment of lung cancer.[2]

Bronchoscopic techniques for early detection of lung cancer are a promising tool as they might allow visualising changes of early lung cancer and also permitting sampling for histological confirmation.[3] Endoscopically visible abnormalities are approached with traditional biopsy forceps, brushings, and washings. The yield of these individual procedures in the diagnosis of lung cancer depends on the location and extent of involvement of the tumor.[4]

Studies have shown that there is an increased yield of the cytological specimens such as sputum when collected post bronchoscopy. This increase could be due to the abrasion of the malignant bronchial surface after forceps biopsy and bronchial brushing.[5] Based on this postulation, we hypothesized that examination of the bronchial washing fluid cytology, which can be collected directly from the bronchi after bronchial brushing, should increase the sensitivity as compared to using only bronchial washing fluid cytology before bronchial brushing.

METHODS

This was a prospective descriptive study conducted in the department of Pulmonary Medicine, AVMC during the period from April 2016 to March 2017. The study was carried out after approval from the Institute research committee and The Institute Ethics committee. Patients attending pulmonary medicine department with a suspected diagnosis of lung cancer were included in the study. Suspicion of cancer was based on both clinical symptoms and radiological abnormalities.

Patients with suspicion of lung cancer were subjected to bronchoscopy using flexible fibre-optic bronchoscope. Patients were also evaluated for bleeding time, clotting time and xylocaine sensitivity as part of pre-bronchoscopy work up. Procedures performed for the retrieval of tissue samples included Bronchial washings (pre and post brushing) and bronchial brushing. 20-30 ml of normal saline was instilled through the working channel. After infusion, the fluid was momentarily allowed to mingle with the surrounding environment. Constant suction was then applied to retrieve as much volume as possible into the sterile collection trap. Recovery of 60% of the infusate was considered adequate. In the absence of visible lesion, brushings were also done in segments that showed mucosal irregularities (elevations, corrugations or erythematous lesions) suspicious of malignancy. Any bleeding during the procedure was arrested using instillation of cold saline and wherever necessary also adrenaline/ xylocaine was also instilled. Once homeostasis was achieved post brushing washings was done with normal saline instillation. The cytological results were classified as positive for malignancy only when the results were read as “suspicious for malignancy” or as “malignancy”, the other readings were considered negative for malignancy.

The sensitivity of each procedure is the proportion of the number of specimens having malignant cytology diagnosis compared to the total number of specimens with a definite diagnosis of malignancy.

Statistical analysis

Chi-square test and McNemar’s test were used to compare the sensitivity of each procedure. A value of $p<0.05$ was considered statistically significant.

RESULTS

A total of 57 cases [40 (70.2%) males and 17 (29.8%) females] were included in the study. The mean age at presentation was 54.3 years with a range of 34 to 70. The mean age in males was 52.4 years and in females was 55.6 years. Male to female ratio was 2.4:1. Out of 57 cases 8 (14%) patients had findings of a narrowed bronchus. 22 (38.3%) had corrugations, erythema or an obstructed bronchus (suspicious of malignancy). 27 (47.4%) of patients had an endobronchial growth in their tracheobronchial tree.

As per the bronchoscopy findings of the 57 patients 31 patients had involvement of the right lung while 26 patients had left lung involvement. 8 patients had involvement of right upper lobe, 6 had right main bronchus involvement and 5 patients had lesion in the intermediate bronchus. 5 patients had involvement of the right middle lobe while 7 patients had involvement of the right lower lobe.

Bronchial washings

Pre and post brush bronchial washings was done in 57 cases. The pre-brush bronchial washings were positive for malignancy in 18 of the 57 cases (31.6%). Post brush bronchial washings were positive for malignancy in 18 of the 57 cases (31.6%) (the members of this group were not all the same as the members of the pre-brush group). Adding both pre and post brush washings, cytology was positive in 22 of the 57 cases (38.2%). There was no statistically significant difference ($p>0.05$) between the sensitivity of positive Bronchial Washing for pre and post brush (McNemar’s test). This finding was also the same when the results were analyzed according to different lesion characteristics. In our study, the yield of bronchial washings in visible endobronchial growth was 29.6% (8 out of 27) and 33.3% (10 out of 30) in no visible endobronchial growth.

Bronchial brushing

Brushings were positive for malignant cells in 35 of the 57 cases (61.4%). Of the 35 cases 16 cases were adenocarcinoma, 13 were squamous cell carcinoma, 2 were bronchoalveolar cell carcinoma, 2 were small cell carcinoma, 1 with suspicious of malignancy and 1 showing atypical cells.

Out of the 27 cases that had endobronchial growth, brushings were positive for malignant cells in 20 cases (74.2%). Of the 20 cases 18 cases were non-small cell carcinoma (10 squamous cell carcinoma, 7 adenocarcinomas and 1 bronchoalveolar cell carcinoma), 1 small cell carcinoma and 1 case showed atypical cells.

Bronchial washing alone was diagnostic in 3 cases in which brushings were negative for malignant cells. In 17 of the 35 cases only brushings were diagnostic with

washings were negative for malignant cells. Four patients developed minimal hemoptysis after bronchial brushing of an endobronchial growth. During bronchoscopy bleeding was controlled using instillation of adrenaline-xylocaine and cold saline.

Endobronchial biopsy was done in 19 of the 57 cases (33.3%). Biopsy was positive for malignancy in 11 of 19 (58.2%) cases. Out of the 11 cases 9 were non-small cell carcinoma and 2 were small cell carcinoma. Of the 9 non-small cell carcinoma cases 6 were squamous cell carcinoma, 2 adenocarcinomas and 1 bronchoalveolar carcinoma. Biopsy was negative in 8 cases.

Radiology

The most common radiological presentation is mass lesion, seen in 30 cases (52.6%). The presence of collapse was seen in 13 cases (22.9%). Effusion was seen in 15 cases (26.3%). 12 cases presented only with effusion, 3 cases had mass with effusion. 8 had right sided effusion while 7 had left sided effusion. Rib erosion was present in 7 cases (12.8%). In present study, the common radiological site of involvement was upper zone in 29 (50.8%) cases, followed by mid zone seen in 14 (24.5%) cases and lower zone seen in 12 (21.2%) cases. 2 (3.5%) patients had whole lung involvement

Histology

Of the 57 cases 54 were non-small cell lung cancer (94.7%) and 3 were small cell lung cancer (5.3%). Out of 54 cases of non-small cell lung cancer adenocarcinoma was the commonest type seen in 32 (56.1%) patients followed by squamous cell carcinoma seen in 20 (35.1%) patients and Bronchoalveolar cell carcinoma was seen in 2 patients (3.5%).

DISCUSSION

The mean age of the subjects in our study was 54.3 (34-70) with mean age of 52.4 in males and 55.6 in female. This was similar to the other studies that varied between 48.5 years to 57.2 years. Jindal et al in a review of 1009 cases showed a mean age of 54 years (mean age of 54.6 years in males and 52.10 years in females).[6] Another study by Prasad R et al reported the mean age to be 57 years.[7] The male to female ratio was 2.4: 1. The ratio was lower compared to the other Indian studies where the male to female ratio varied from 4.5:1 to 7.8:1.[8-11] The reason for a lower ratio may be due to the relatively smaller sample size compared to the above-mentioned studies. Smith et al had suggested that the variation in male to female ratio is due to difference in smoking habits and environmental exposure to carcinogens.[12] This could also another reason for a lower ratio in our study.

Most common radiological presentation was mass lesion, seen in 30 cases (52.6%) followed by collapse in 13 cases (22.9%). Pleural effusion was seen in 15 cases (26.3%). Rib erosion was present in 7 cases (12.8%). Behera et al have done an analysis of Indian studies published on lung cancer and found, mass in 72% with or without collapse and is the commonest radiological finding in lung cancer.[13] They also showed that pleural effusion was seen in 25.1% of cases and rib erosion was seen in 4.8% of cases.

Out of the 57 cases 8 (14%) patients had a narrowed bronchus, 22 (38.3%) patients had corrugations/ erythema or obstructed bronchus and 27 (47.4%) patients had endobronchial growth.

In present study, the yield of pre-brush bronchial washing was 31.6% (18 of 57). Similarly, the yield of post brush bronchial washing was also 31.6% (18 of 57). In a study by Funashi A et al in 63 patients showed that bronchial washings yielded a diagnosis in 17 (26.9%) patients.[14] Similarly study by Win et al in a study of 78 patients reported that the yield of washings was 45%.[15] Another study by Karahalli et al in 98 patients have reported that the yield of bronchial washings were 32%.[16]

In present study, the yield of bronchial washings in visible endobronchial growth was 29.6% (8 out of 27) and 33.3% (10 out of 30) in no visible endobronchial growth. Kvale PA et al in their study had reported that the yield of bronchial washings in visible endobronchial growth was 63% (45 out of 71) compared to 6% (1 out of 17) in no visible endobronchial growth.[17] This study showed a higher yield in endobronchial growth compared to our study.

In this study, the yield of pre brush bronchial wash was 31.6% and post brush bronchial wash was 31.6%. In a study by Vanderdrift et al in 271 patients reported that the sensitivities of bronchial washing cytology before and after brushing were 36% and 42%.[18] Funashi A et al in their study showed that addition of bronchial washings to forceps biopsy and brush did not increase the overall diagnostic sensitivity of bronchoscopy for endoscopically visible lung cancers.[14] In present study also there was no difference between the yield of pre-brush washing and post brush washing. Addition of post brush washing did not increase the diagnostic yield in our study.

Adding both pre-brush and post brush bronchial wash the yield was 38.6% (22 of 57 cases). Sompradeekul S et al in their study had showed that the yield of bronchial wash before brush and biopsy was 37.8% (31/82) and after brush and biopsy was 37.8% (31/82).[19] Adding both the yield of bronchial wash was 46.3% (38/82). They found an increase in the yield of combined pre and post brush and biopsy bronchial wash cytology compared to using either one. These results were similar to our study where there is an increase in the yield after adding both pre and post brush bronchial wash.

In current study, bronchial washing alone was diagnostic in 3 cases (5.2%) in which brushings were negative for

malignant cells. Chau CH et al in their study had showed that 2.9% of cases were diagnosed solely by cytologic examination of bronchial washings.[20] Sompradeekul S et al in their study had showed that bronchial washings alone were diagnostic in 4.8% (4 of 82) cases.[19] These results are similar to our study. This suggests that bronchial wash is helpful in assisting the diagnosis of malignancy.

The overall diagnostic yield of bronchial wash in this study is similar when compared to the above-mentioned studies. Though the yield of bronchial wash is relatively low, it is cost-effective to use this procedure in the diagnostic workup of patients who are clinically suspected of having a pulmonary malignancy.

In present study, bronchial brushings were positive for malignant cells in 35 of the 57 cases giving a yield of 61.4% compared to a yield of 31.6% by bronchial washings. The yield of brush cytology was more than the yield of bronchial washings.

Similar study by Kvale PA et al in 1976 showed the yield of bronchial brushings to be 65% compared to 51% for washings.[17] D A Solomon et al in their study showed the yield of bronchial brushings to be 89% (41 of 46) compared to16% (7 of 46) by bronchial washings.[21] Gaur et al in their study of 196 patients (71 proven cases) showed the yield of brush cytology to be 87.5% while that of bronchial washings was 39.5%.[22] These results suggest that yield of brush cytology is higher than the yield of washing.

In this study, out of the 27 cases with endobronchial growth brushings were positive for malignant cells in 20 cases giving a yield of 74.2%. Out of the 30 patients without visible endobronchial growth (22 patients with corrugations; 8 patients with narrowed bronchus) brushings were positive for malignant cells in 15 of 30 cases giving a yield of 50%.

Study by Kvale PA et al in 1976 showed that the yield of bronchial brushings was 77% (54 of 70 patients) in centrally located tumors compared to 28% (5 of 18 patients) in peripherally located tumors.[17] In a study by Govert J et al showed that the yield of bronchial brushings is 45% (85 of 177) in visible endobronchial growth compared to 35.2% (60 of 170) in patients with no visible endobronchial growth.[23] These results were similar to present study where there was a higher yield in patients with visible endobronchial growth.

In present study brush cytology alone was diagnostic in 17 of 57 cases (29.8%). Gaur et al in their study of 181 patients had showed that brush cytology alone was diagnostic in 34 of 181 cases (18.7%).[22] Bronchial brushing is a very convenient cytological technique for early diagnosis of lung cancer.

Study had no serious complications such as massive hemoptysis, respiratory failure, and severe hypoxemia in our study despite the longer duration of procedures using two BW. The advantages of our study were that both pre and post-forceps biopsy BW were from the same location, from the same patient, performed by the same bronchoscopist, on the same day. This reduced subject variability. The numbers of patients taken up for the study are significant but future studies with a larger sample size are required for further confirmation.

CONCLUSION

From this study results, we found increased sensitivity of combined pre and post-forceps biopsy BW cytology compared to using either one exclusively. This may help to improve the sensitivity of bronchoscopic methods for use in the diagnosis of lung cancer. In our study, we could not demonstrate a statistically significant difference in the sensitivity between pre and post-forceps biopsy BW regardless of the lesion characteristics (endobronchial or non-endobronchial lesions). There were a few cases where the malignancy diagnosis could be demonstrated only from BW, either pre or post-brush. This suggests that BW is helpful and should not be disregarded in assisting the diagnosis of malignancy using FOB.

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