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Original Research Article

Diagnostic yield of conventional transbronchial needle aspiration in suspected bronchogenic carcinoma without intraluminal growth on bronchoscopy

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ABSTRACT

Background: Bronchogenic carcinoma with spread along the mucosal plane presents as an exophytic mass. Most of the submucosal and peribronchial patterns of this malignancy are harder to detect by standard diagnostic procedures such as bronchial washing, brushing and forceps biopsy. We sought to investigate the utility of transbronchial needle aspiration (TBNA) in the diagnosis of bronchogenic carcinoma without intraluminal mass, through prospective analysis of routine diagnostic bronchoscopies performed in a 24-month period, at a tertiary care hospital.
Methods: Patients with suspected bronchogenic carcinoma (clinical and radiological) underwent standard computed tomography (CT) of thorax. Further the patients were subjected to conventional TBNA, singly, and in combination with bronchial washings and brushings. The results were analyzed statistically for the diagnostic yield of TBNA.
Results: Among the 42 patients assessed, 29 had malignancy confirmed by forceps biopsy or CT guided Fine Needle aspiration cytology or biopsy and bronchoscopy. Among them, 17 cases were detected by a combination of the results of bronchial washing, brushing and TBNA. The individual sensitivities amounted to 3.4% (n=1), 51.72% (n=15) and 27.6% (n=8), respectively. There were no false positive results. Concerning different bronchoscopic sampling techniques, 9 cases were diagnosed solely by bronchial brushings and 2 cases by TBNA alone. No periprocedural complications were encountered.
Conclusions: Value of bronchial brushing in the diagnosis of bronchogenic carcinoma without bronchoscopically visible intraluminal mass is above that of conventional TBNA. Addition of bronchial washings, to bronchial brushings and TBNA has an insignificant impact on the diagnosis.

Keywords: Bronchogenic carcinoma, Bronchial washing, Bronchial brushing, Transbronchial needle aspiration

INTRODUCTION

Lung carcinoma was the most commonly diagnosed cancer, as well as the leading cause of cancer mortality among males, globally, in the year 2008.[1] Among females, it was the fourth most commonly diagnosed cancer and the second leading cause of cancer death.[1] Lung carcinoma accounted for 13% (1.6 million) of the total cases and 18% (1.4 million) of the deaths in 2008. The National Cancer Registry programme (NCRP 2001-2003) by the Indian Council of Medical Research (ICMR), reveals that lung was the leading site of cancer in Thiruvananthapuram, Kerala, India accounting for 13.6% of all cancers in males.

Lung cancer presenting as an endobronchial disease may manifest either as an exophytic intraluminal mass, or as

submucosal infiltration leading to thickening of the bronchial wall, or with extrinsic compression of the airway from peribronchial spread. These presentations may also be associated with metastasis to the hilar or mediastinal lymph nodes. Diagnosis of this form of lung carcinoma poses a diagnostic challenge to the respiratory physician, bringing into light the high failure rate of the standard diagnostic techniques in detecting the disease. The use of transbronchial needle aspiration (TBNA), a cost-effective, minimally invasive bronchoscopic sampling technique, in the staging of lung cancer and in the diagnosis of peripheral lesions has been well documented.[2,3] However, there is paucity of literature, exploring the value of this test in the diagnosis and staging of carcinoma lung with predominant submucosal or peribronchial components.

We designed this study to define the sensitivity of conventional TBNA, singly, and in combination with cytological samples obtained through the conventional diagnostic modalities: bronchial washing and brushing, in the diagnosis of bronchogenic carcinoma in patients without visible endobronchial mass on fiberoptic bronchoscopy.

METHODS

Patient characteristics

Patients presenting for diagnostic evaluation of suspected bronchogenic carcinoma (clinical and radiological) to Amala Institute of Medical Sciences, Kerala, India during the two-year study period, were considered for enrolment into this prospective clinical study. These patients had various initial findings on history, physical examination, or X-ray film; but in all of the patients, bronchogenic carcinoma was one of the leading differential diagnoses. Patients with visible intraluminal mass on video bronchoscopy were considered ineligible for inclusion into the study.

Protocol

Written informed consent was obtained from every patient prior to the procedure. All patients underwent standard computed tomography (CT) scanning of the thorax for identification of sites of enlarged lymph nodes, followed by careful review of the CT scan to obtain the precise location of the enlarged lymph nodes prior to bronchoscopy.

TBNA was performed along with video bronchoscopy, with an Olympus BF1T160 fiberoptic bronchoscope, under conscious sedation and local anaesthesia with 2% lignocaine (to minimize cough), and using 19 g x 1.5 cm needles (Olympus Corp.). Sites for sampling were identified by indirect evidences like erythema, extrinsically compressed airway, thickened mucosal stripes, and loss of normal bronchial markings or by intuition from careful review of chest CT scans.[4] To minimize sampling error due to contamination from tracheobronchial secretions, care was taken to collect TBNAs prior to examination of the distal bronchial tree. The needle catheter is introduced through the suction channel and the distal tip of the needle is placed in a position just visible from the end of the bronchoscope to facilitate accurate placement. The needle tip was initially advanced at an acute angle, so that the submucosal layer could also be accessed, followed by introduction of the entire length through the bronchial wall. Two to three passes were done at the same involved area.[4] Once the needle was embedded, suction was applied with a syringe connected to the distal end of the needle, while vigorously agitating the needle to and fro. Suction was then gradually released while withdrawing the needle carefully.

Bronchial brushing was then taken from in and around the involved area, using nylon cytobrush, carried out, as protected specimen brushing, to prevent damage to airway during introduction and retraction of the brush. Bronchial washing with approximately 60 ml normal saline, was performed after bronchial brushing.

Bronchial washings were collected in appropriate jars. TBNA and bronchial brush specimens were smeared on to clean glass slides by the smear technique described by Ndukwu et al, and transported to the laboratory in coplin jars containing formaldehyde fixative.[5] Specimens were stained by the Papanicolau method and screened for atypical or malignant cells by the cytopathologist. Results of cytological analysis were labeled as positive (if malignancy was detected), suspicious or negative (when no evidence of malignancy could be traced). For this study, only those reports stamped as positive were considered.

Statistical analysis

The data obtained was statistically analysed using the IBM software Statistical Package for Social Sciences (SPSS, v 16, IBM, CA, USA). Results were considered significant when the value of $p < 0.05$.

RESULTS

Overall, in 29 of the 42 patients included into this study, malignancy was finally confirmed by either conventional diagnostic procedure (bronchial wash, protected specimen brush and forceps biopsy) and/or with TBNA or CT guided transthoracic FNAC or FNAB. Among them, bronchial washing, brushing and TBNA, together, accurately diagnosed lung malignancy in 17 patients, giving a sensitivity index of 58.62% to the combination of the three techniques. No major periprocedural complications like pneumothorax or major bleeding from the site were encountered.

Present results are summarised in figure 1. Bronchial washings, bronchial brushings and conventional TBNA

yielded cytological diagnosis in 1 (2.38%), 15 (35.7%) and 8 (19.04%) patients, respectively. The combination of bronchial brushings and conventional TBNA gave diagnosis in 17 (40.4%) patients. The technique of bronchial wash was positive in 1 patient, in whom, both the other techniques were also positive. Thus, the combination of bronchial washings with either, bronchial brushings or TBNA made an insignificant impact on the diagnosis. The sensitivity of bronchial washings, bronchial brushings and conventional TBNA turned out to be 3.4%, 51.72% and 27.6%, respectively. Bronchial brushings alone detected a significant number (9 of 29) of cases that had a false negative result on TBNA. Whereas, bronchial brushing was the most reliable tool in our study, 2 cases that were missed by bronchial brushings were diagnosed solely by TBNA. On application of the χ^2 test, we derived that there was a statistical difference between the diagnostic yields of bronchial brushings and conventional TBNA (p=0.016).

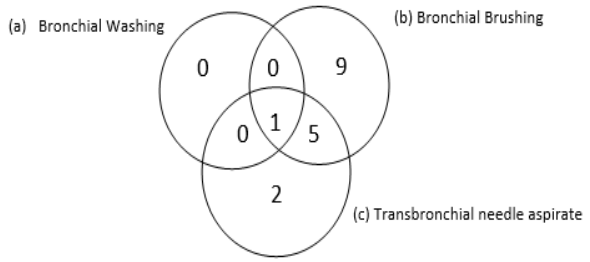

Figure 1: Venn diagram showing the positive results for each technique, presented with their coincidences; (a) Bronchial washing; (b) Bronchial brushing; and (c) Transbronchial needle aspiration.

DISCUSSION

Bronchogenic carcinoma may spread in one of the three following patterns: (1) along the mucosal surface, (2) in the submucosal lymphatics, or (3) in the peribronchial lung tissue.[6,7] While the mucosal tumor usually presents as exophytic mass within the lumen of a bronchus, the endoscopic evidences of submucosal and peribronchial tumors may be more subtle in presentation, as: erythema, loss of normal bronchial markings, bronchial narrowing, thickening of the mucosal stripes, or extrinsic compression of the bronchus.[4] Although the diagnostic yield of bronchoscopic forceps biopsy is very high for exophytic masses, submucosal or peribronchial disease is more difficult to sample through the standard forceps biopsy.[8-10]

Bronchial washing and bronchial brushing are two of the conventional diagnostic procedures routinely performed during bronchoscopic sampling. In the present work, the yield of bronchial brushing was the highest. This is attributable to harvest of superior samples, as the technique employs mechanical irritation of the mucosa during sampling. The sensitivity of the procedure was 51.72% with the positive predictive value close to 100%. Our findings are consistent with those of the published literature.[11,12]

However, the value of obtaining washings during fiberoptic bronchoscopy for the workup of lung cancer is controversial. While the diagnostic yield for washings in patients with endoscopically visible (central) tumors varies from 49 to 76% and is similar to the yield for brushings (52 to 77%) but is inferior to the yield of biopsies (71 to 91%); the efficacy of washings in patients with endoscopically nonvisible (peripheral) tumors, varies from 35 to 52% and is similar to the yield for brushings (26 to 52%) and for biopsies (36 to 61%).[11- 14] Some studies have reported that adding bronchial washings to biopsies and brushings increases the diagnostic yield; whereas others, have reported no additional value of washings.[12,13,17-20] In the present study, bronchial washing successfully detected lung carcinoma in a single patient alone, and a sensitivity as low as 3.4%, was obtained. The work by van der Drift et al points out that, although the additional diagnostic yield of washing during bronchoscopy is relatively low, it is cost-effective to use these procedures in the diagnostic workup of patients who are clinically suspected of having a pulmonary malignancy as we would then be saving upon the costs of laboratory investigations, while at the same time, fully exploiting the potential of these minimally invasive procedures.[21]

Recent literatures reveal that autoflourescence imaging video bronchoscopy significantly improves the assessment of central lung cancer extension and influences the therapeutic strategy and that this technique has greater sensitivity and specificity, in assessment of tumor margins, than white light bronchoscopy alone.[22, 23] Thus, the application of autofluorescence bronchoscopy may also increase diagnostic yield of the procedure.

Since TBNA is a well-established technique for the detection and staging of cancer in mediastinal and hilar nodes and peripheral masses, we wanted to determine if the utility of this procedure, could also be extrapolated to detection of submucosal and peribronchial carcinoma. The ability of the needle to penetrate the mucosal surface and reach the outer bronchial layers, offered a theoretical advantage of TBNA over forceps biopsy in such patients, which, we sought to investigate. Yet, the low sensitivity of TBNA (27.6%) for this purpose, which was obtained in the present study, indicates that TBNA, used singly, is an unreliable tool for the detection of carcinoma without endobronchial lesions. However, this could be an underestimation of its true potential. More recently, endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) has been introduced as a novel technique for accessing pretracheal and hilar lymph nodes. There are many reports confirming the diagnostic accuracy and safety of EBUS-TBNA for nodal staging of

non-small cell lung cancer (NSCLC).[24-28] Hence, implementation of ultrasound guidance during the sampling procedure, i.e., EBUS-TBNA would yield more reliable results. Also, TBNA has a documented flaw of being highly operator-dependant. Hence, better technical expertise may increase the diagnostic yield of this conventional procedure.[29] Also, incorporation of rapid on-site evaluation (ROSE) of the samples harvested, by a cytopathologist, would increase yield by a significant figure.[30] The utility of TBNA in the detection and staging of lung carcinoma has been studied extensively, and the technique has been proved favourable for the purpose. However, fear of vascular penetration has caused this simple procedure to be grossly under-utilised, even though serious bleeding consequent to the procedure has never been reported in over 30 years.[31] Although the published literature lucidly recommends TBNA be performed routinely during bronchoscopic sampling in patients undergoing the procedure for detection of lung carcinoma, in those with evidence in favour of submucosal or peribronchial disease, the contribution of conventional TBNA to conventional techniques bronchial wash and brush, is non-significant.

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