International Journal of Biomedical and Advance Research
ISSN: 2229-3809 (Online); 2455-0558 (Print)
Journal DOI: https://doi.org/10.7439/ijbar
CODEN: IJBABN
Original Research Article

Usefulness of Bronchial washings in diagnosing lung malignancy

Ruchee Khandelwal[1], Deepti Agarwal[*2], Akriti Agarwal[3] and Kriti Arora[4]

[1]Associate Professor, [2]Assistant Professor, [3]Clinical Associate, [4]Post Graduate,
Department of Pathology, Shri Ram Murti Smarak Institute of Medical College, Bhojipura, Bareilly- 243202 India

***Correspondence Info:**
Dr. Deepti Agarwal
Assistant Professor,
Department of Pathology,
Shri Ram Murti Smarak Institute of Medical Sciences,
Bhojipura, Bareilly- 243202 India

QR Code

***Article History:**
Received: 24/02/2018
Revised: 15/03/2018
Accepted: 15/03/2018
DOI: https://doi.org/10.7439/ijbar.v9i3.4666

Abstract

Objective: The present study was done to evaluate the yield of bronchial wash in cases of lung cancer.
Methods: This is a 3 year retrospective study which included 163 cases of lung cancer in whom bronchial wash cytology had been done.
Results: The age range was from 34 to 88 years and Male: Female ratio was 5.5:1. The sensitivity of bronchial wash was found to be 24.5% and the false negative index was 32.5%. The sensitivity of endobronchial biopsy was 93.4%. Tumor typing into small cell carcinoma and non-small cell carcinoma could be done on cytology in 85% of cases positive on bronchial wash. Squamous cell carcinoma was the most common type. Interestingly one case was diagnosed as Adenoid cystic carcinoma which was later confirmed on biopsy.
Conclusion: There is still disagreement as to the value and reliability of bronchial wash cytology in diagnosing lung cancer. Bonchial wash cytology has low sensitivity for detecting lung cancer; however, it may be a useful diagnostic test in patients in whom endobronchial biopsy cannot be done.
Keywords: Bronchial wash, Cytology, Lung cancer, Sensitivity.

1. Introduction

Lung cancer is the most frequently diagnosed cancer and also the leading cause of all cancer associated deaths in the world [1]. Previously bronchogenic carcinoma was considered to be infrequent in India, but in the recent past a trend of increase in its incidence has been noticed [2]. The increase in the incidence of lung cancer follows the increasing adoption of smoking which is by far the biggest causal factor in lung cancer [3]. The relationship between cigarette smoking and lung cancer is complex, however, and individuals differ in their susceptibility to the carcinogenic effects of cigarette smoking and probably other environmental agents [4]. Lung cancer is also an occupational disease. The industrial agents reported to cause lung cancer include chloromethyl ether, mustard gas, polycyclic aromatic hydrocarbons, silica, cadmium and asbestos [4].

The best opportunity for long term survival and cure of lung cancer lies in early diagnosis and surgical resection [4]. Development in sampling techniques, in particular the advent of fiberoptic endoscopic techniques in 1960s and more recent use of FNA for obtaining material have changed the practice of respiratory tract cytology. It must be emphasized that cytology is a method of choice in the diagnosis of radiologically detected lung lesions suspected of being malignant [4]. The cytological methods range from completely non-invasive methods (examination of spontaneously expectorated sputum) to those that are minimally invasive but still applicable to even severely ill patients (bronchial brushings & washings) [5]. Bronchial brushings and bronchial washings are directed toward mucosal and submucocal lesions.

Brushings attempts to dislodge cells from an ulcerated lesion or an abnormal mucosa and often provides larger amounts of tissues in an excellent state of preservation [5]. Cell yield in a BB is better than aspirate and washing. However, wash technique samples out the areas beyond the reach of brush and bronchial biopsies cannot be performed in more peripheral sites or in patients at risk of hemorrhage

Among various bronchoscopic techniques, bronchial biopsy has the highest sensitivity for endobronchial malignant lesions [6]. Bronchoscopic washings, brushings may complement tissue biopsies in the diagnosis of lung lesions.

The benefits of bronchial washing which provides the diagnostic yield for endoscopically visible tumor between 30-90%, is still controversial [7]. Though the diagnostic yield of washings may be small but the costs incurred by further investigation in case of negative test may be high. There have been many studies that support the role of bronchial washings in addition to endobronchial biopsies and brushings [8,9], whereas other researchers have failed to show any benefits [10,11].

Thus, we conducted this study to evaluate the role of bronchial washing in diagnosing lung cancer.

2. Material and Method

This is a 3 year retrospective study conducted from August 2014 to July 2017 in the department of Pathology at Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly to evaluate the efficacy of bronchial washings in diagnosing lung cancer. Records of 735 patients suspected of lung cancer were analysed and only 163 cases who were diagnosed with lung cancer on any of the tests including bronchial brush, bronchial wash, endobronchial biopsy or CT guided FNAC were included in the study. Bronchial wash had been done in all the patients included in the study. Bronchial washings were carried out by flushing the tumor with 20-40 ml of 0.9% normal saline. The aspirated fluid was collected in a bottle and transported to the laboratory for centrifugation and cytocentrifugation. The smears were finally stained by MGG and Papanicolaou stain.

The well prepared, properly stained and well visualized smears with minimal obscuring elements were considered satisfactory. The results of the cytology were reported as:

- Positive for malignancy
- Negative for malignancy/ Benign
- Suspicious of malignancy/ Atypical cells
- Inadequate smears

The smears which failed to reveal any morphological features to reliably distinguish benign from malignant specimens were labelled as suspicious of malignancy. An attempt was made to classify positive cases into squamous cell carcinoma, adenocarcinoma, small cell carcinoma or any other type [12] wherever possible. Those cases where cytological distinction between squamous cell carcinoma and adenocarcinoma was not possible were classified under Non- small cell lung carcinoma and those where tumor typing could not be done at all were classified simply as positive.

The sensitivities for bronchial washing and endobronchial biopsy were calculated and results compared. Although suspicious cases are clinically important and warrant further investigations to exclude malignancy, they do not confirm cancer or indicate tumor type and therefore preclude patient treatment. Thus, we did not include them in positive category while calculating sensitivity.

3. Results

The study included 163 cases of lung cancer in whom bronchial wash cytology had been done. The age of the patients ranged from 34 to 88 years with a Male: Female ratio of 5.5:1. Peak age incidence was found in 6 decade followed by 5 decade. [Table 1]

Table 1: Age and sex wise distribution of lung cancers

Age (years)	Males	Females	Total	Percentage (%)
31-40	10	02	12	7.4
41-50	35	03	38	23.3
51-60	40	10	50	30.7
61-70	28	05	33	20.2
>70	25	05	30	18.4
Total	**138**	**25**	**163**	**100**

The bronchial wash was positive in only 40 (24.5%) cases and suspicious in 58 (35.6%) cases. [Table 2]

Table 2: Broad categorization of lung lesions on Bronchial wash

Category	Number of cases	Percentage
Positive for malignancy	40	24.5
Negative for malignancy	53	32.5
Suspicious of malignancy/Atypical cells	58	35.6
Inadequate	12	7.4
Total	**163**	**100**

The sensitivity of bronchial wash was found to be 24.5% and the false negative index was 32.5% (excluding the suspicious cases). Biopsy was done in 136 cases and was positive in 93.4% cases.

Bronchial wash alone was positive in 6 (3.68%) cases. Out of these 6 cases biopsy could not be done in 5 cases and in one case biopsy was done but negative.

Out of the 40 cases which were positive on bronchial wash, tumor typing into specific categories of squamous cell carcinoma [Figure 1], adenocarcinoma [Figure 2] and small cell carcinoma could be done only in

15 cases. 19 cases were classified broadly as non small cell carcinoma whereas no typing at all could be done in 5 cases. One case was diagnosed as Adenoid cystic carcinoma. [Table 3]

Table 3: Elaborates the tumor typing done in positive cases on bronchial wash

Tumor type	Number of cases	Percentage
Squamous cell carcinoma	06	15
Adenocarcinoma	05	12.5
Small cell carcinoma	04	10
Non-small cell carcinoma	19	47.5
Adenoid cystic carcinoma	01	2.5
Positive for malignancy	05	12.5
Total	**40**	**100**

Figure 1: Photomicrograph of bronchial wash smear showing squamous cell carcinoma (400x)

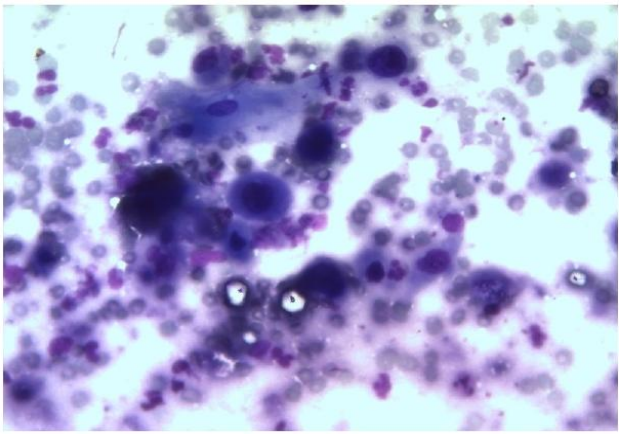
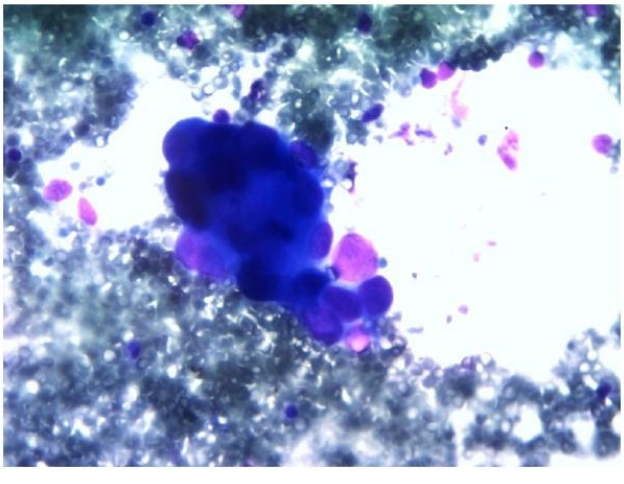


Figure 2: Photomicrograph of cytological smear showing Adenocarcinoma (400x)



4. Discussion

The present study was conducted to evaluate the efficacy of bronchial wash in lung cancer patients. Lung cancer mortality remains a major health issue causing over a million deaths worldwide in 2000 according to WHO data [13]. Lung cancer has surpassed breast cancer as the leading cause of cancer death in women [13]. This has been related to increasing incidence of smoking in women. Histological or cytological confirmation is known to be associated with a higher rate of specific oncology treatment for lung cancer patients.

The age of the patients ranged from 34 to 88 years with peak incidence in 6 decade which is similar to various other studies [14-18]. The Male: Female ratio was 5.5:1, similar to that observed by Faludi *et al*, Raiza *et al* and Vigg *et al* [16,18,19]. This is due to high prevalence of smoking in men.

There has been a controversy as to whether bronchial washing should be routinely used or not. Many studies like Rosell *et al*, Karahalli *et al* and Bodh *et al* did not find any significant increase in the yield when bronchial wash was added to the biopsy [20-22]. However, Lam *et al*, Mak *et al*, Jones *et al*, Dobler *et al* and Stringfeild *et al* have suggested that bronchial biopsy, brush and wash should be performed together to obtain maximum diagnostic yield [8, 23-26]. We got yield of only one extra case in patients in whom biopsy has also been done. However, bronchial wash helped to diagnose 5 out of 27 i.e. 18.5% of cases in whom biopsy could not be done. Thus, stressing the role of bronchial wash in patients in whom biopsy cannot be done.

Liwsrisakun *et al* have observed that though beneficial, performing bronchial wash in all the patients may not be cost effective [27]. Mak *et al* and Jones *et al* have suggested the idea of holding wash specimens for processing until a time when endobronchial biopsy or brush results were negative in suspected cases of lung cancer [23,24]. This opinion is supported by our study also.

We found the sensitivity of bronchial wash to be only 24.5%. A wide range of sensitivities have been reported by different authors: Karahalli *et al* (31.6%), Bodh *et al* (36.8%), Mak *et al* (52%), Dobler *et al* (38%) and Rawat *et al* (47.7%) [21-23,25,28]. Chaudhary et al and Govert et al have reported higher values of 84.8%, 88.89% and 75.4% respectively [9,29]. Chaudhary *et al* found bronchial wash to give higher yield than biopsy [9]. The variable yields are due to variabilities in technique used, pre and post biopsy wash specimens, variable approach towards suspicious cases and biopsies done in variable number of cases. Several factors have been suggested to affect the diagnostic yield of bronchial washing like tumor size and distance of the tumor from the carina or hilum [30]. Liwsrisakun *et al* reported that tumors on top with necrotic debris and tumors with active bleeding might be positive or negative predictors of bronchial washings [27]. We have reported 93.4% sensitivity for biopsy. Sensitivities ranging from 71.6% to 97% have been reported by various authors [8,15, 20, 23-25, 29,31-33] for endobronchial biopsy. This may be due to different policies about number of samples taken and endobronchial or submucosal lesion types included in different studies.

We found false negative index for bronchial wash to be 32.5% which is similar to Rao *et al* who have reported 31.03% false negative results on cytology [34]. The reason for missing the lesions on cytology could be due to several factors like secondary inflammation, non- representative material, hemorrhage, suboptimal cell yield etc.

Tumor typing into broad categories like small cell and non-small cell lung carcinoma could be done in 85% cases positive on bronchial wash. But only 37.5% cases could be typed into specific categories of adenocarcinoma, squamous cell carcinoma or small cell carcinoma which is now a days considered mandatory for recommending optimal chemotherapy regimen [35]. Problems in tumor typing have also been faced by several other authors [18, 27,35]. Jones *et al* could type 94% cases on cytology into small cell and non small cell carcinoma [24]. Lam *et al* observed cell typing accuracy to be 92% for epidermoid carcinoma, 87% for small cell carcinoma and 83% for adenocarcinoma [8]. Truong *et al* observed cytological typing of squamous cell carcinoma and small cell carcinoma to be highly accurate [36]. Lamb and Corrin have suggested that in some cases cytological features as opposed to tissue patterns might be of more value [24]. The difficulties in specifying the tumor on cytology can be due to lack of cell groups, keratinisation, mucus production and scant cellular material.

We reported one case of Adenoid cystic carcinoma and its diagnosis could be correctly made on cytology also. Primary adenoid cystic carcinoma of lung arising from bronchial glands is a rare disease accounting for only 0.04-0.2% of all primary lung tumors [37]. There have been few cases reported on cytology [38].

5. Conclusion

- Bonchial wash cytology has low sensitivity for detecting lung cancer; however, it may be a useful diagnostic test in patients in whom endobronchial biopsy cannot be done.
- Tumor typing is poor on bronchial wash cytology thus requiring further tests for specific tumor therapy to be given.

References

[1]. Parkin DM, Bray F, Ferlay J, Pisani P. Global cancer statistics, 2002. *CA Cancer J Clin* 2005;55:74-108.

[2]. Behera D, Balamugesh T. Lung cancer in India. *Indian J Chest Dis Allied Sci* 2004; 46:269-81.

[3]. Park K. Park's textbook of preventive and social medicine.23rd ed. Jabalpur: M/s Banarsidas Bhanot; 2015.p.390-1.

[4]. Myron RM. Tumors of the lung: Conventional Cytology and Aspiration Biopsy. In: Leopold GK, Myron RM, editors. Koss' Diagnostic and its histopathologic bases. 5 edn. Philadelphia: Lippincott Williams and Wilkins; 2006.p.643-712.

[5]. Geisinger KR, Raab SS, Stanley MW, Silverman JF. Modern cytopathology. Philadelphia: Churchill Livingstone; 2004. p.404-32

[6]. Schreiber G, McCrory DC. Performance characteristics of different modalities for diagnosis of suspected lung cancer: Summary of published evidence. *Chest* 2003; 123(1Suppl): 115S-28S.

[7]. Mazzone P, Jain P, Arroliga AC, Matthay RA. Broncoscopy and needle biopsy techniques for diagnosis and staging of lung cancer. *Clin Chest Med.* 2002 Mar; 23(1):137-58.

[8]. Lam WK, So SY, Hsu C, Yu DYC. Fibreoptic bronchoscopy in the diagnosis of bronchial cancer: comparison of washings, brushings and biopsies in central and peripheral tumours. *Clin Oncol* 1983; 9: 35–42.

[9]. Chaudhary BA, Yoneda K, Burki NK. Fiberoptic bronchoscopy: comparison of procedures used in the diagnosis of lung cancer. *J Thorac Cardiovasc Surg* 1978; 76: 33-7.

[10]. Kvale PA, Bode FR, Kini S. Diagnostic accuracy in lung cancer: comparison of techniques used in association with flexible fiberoptic bronchoscopy. *Chest* 1976; 69:752-727.

[11]. Funahashi A, Browne TK, Houser WC, Hranicka LJ. Diagnostic value of bronchial aspirate and post bronchoscopic sputum in fiberoptic bronchoscopy. *Chest* 1979; 76: 514-7.

[12]. Travis WD, Brambilla E, Muller-Hermelink HK, Harris CCv (Eds): World Health Organization Classification of Tumors. Pathology and genetics of Tumors of the lung, pleura, thymus and heart. IARC Press: Lyon 2004

[13]. Fraser GS, Bhatt N, Dangoor A, Sephton M. Classification and treatment of non-small-cell lung carcinoma. In: Pignatelli M, Gallagher P, editors. Recent Advances in Histopathology. 23 ed. London: JP Medical Ltd;2014.p.31-45

[14]. Sarma A, Sharma JD, Bhuyan C, Kataki AC, Sangma RA. A Study of Cytological Evaluation of Bronchial Washing and Brushing In Bronchogenic Carcinoma. *Int J Sci Res.* 2013; 3(8):1-7.

[15]. Reddy S, Vivekanand N, Durga K. Efficacy of bronchial wash and brush cytology in the diagnosis of lung cancers. *Sch J App Med. Sci.* 2014; 2(2D): 816-20.

[16]. Fuladi AB, Munje RP, Tayade BO. Value of Washings, brushings and biopsy at fibreoptic bronchoscopy in the diagnosis of lung cancer. *J Indian Acad Clin Med*. 2004 Apr; 5(2):137-42.

[17]. Ahmad M, Afzal S, Saeed W, Mubarik A, Saleem N, Khan SA *et al*. Efficacy of Bronchial wash cytology

and its correlation with biopsy in lung tumors. *J Pak Med Assoc*. 2004Jan; 54(1):13-6.

[18]. Raiza D, Rout S, Reddy KP, Ramalaxmi P, Prithvi BK, Harikishan KS. Efficacy of bronchial wash and brush cytology and its correlation with biopsy in lung lesions. *IJHRMIMS.* 2014 Oct;1(1): 21-24

[19]. Vigg A, Mantri S, Vigg A, Vigg A. Pattern of Lung Cancer in Elderly. *JAPI.* 2003Oct; 51: 963-966.

[20]. Rosell A, Monso E, Lores L *et al*. Cytology of bronchial biopsy rinse fluid to improve the diagnostic yield of lung cancer. *Eur Respir J* 1998; 12 (6): 1415-8.

[21]. Karahalli E, Yilmaz A, Türker H, Ozvaran K. Usefulness of various diagnostic techniques during fiberoptic bronchoscopy for endoscopically visible lung cancer: Should cytologic examinations be performed routinely? *Respiration* 2001; 68:611-4.

[22]. Bodh A, Kaushal V, Kashyap S, Gulati A. Cytohistological correlation in diagnosis of lung tumors by using fibreoptic bronchoscopy: Study of 200 cases. *Indian J Pathol Microbiol*. 2013 Apr; 56(2): 84-8.

[23]. Mak VHF, Johnston IDA, Hetzel MR, Grubb C. Value of washings and brushings at fibreoptic bronchoscopy in the diagnosis of lung cancer. Thorax 1990; 45: 373–376.

[24]. Jones AM, Hanson IM, Armstrong GR, O'Driscoll BR. Value and accuracy of cytology in addition to histology in the diagnosis of lung cancer at flexible bronchoscopy. *Respir Med.* 2001;(95):374-78

[25]. Dobler CC, Crawford AB. Bronchoscopic diagnosis of endoscopically visible lung malignancies: should cytological examinations be carried out routinely. *Intern Med J.* 2009 Dec; 39(12): 806-11.

[26]. Stringfield JT, Markowitz DJ, Bentz RR *et al*. The effect of tumor size and location on diagnosis by fiberoptic bronchoscopy. *Chest* 1977; 72 (4): 474-6. 12.

[27]. Liwsrisakun C, Pothirat C, Bumroongkit C, Deesomchok A. Role of Bronhchial washings in the diagnosis of endoscopically visible lung cancer. *J Med Assoc Thai.* 2004; 87(6):599-604.

[28]. Rawat J, Sindhwani G, Saini S, Kishore S, Kusum A, Sharma A. Usefulness and cost effectiveness of bronchial washing in diagnosing endobronchial malignancies. *Lung India*. 2007; 24:139-41.

[29]. Govert JA, Kopita JM, Matchar D, Kussin PS, Samvelson WM. Cost-effectiveness of collecting routine cytologic specimens during routine bronchoscopy for endoscopically visible lung tumour. *Chest* 1996; 109: 451–456.

[30]. Lee Hs, Kwon SY, Kim DK, Yoon HI, Lee SM, Lee JH *et al*. Determinants of diagnostic bronchial washing in peripheral lung cancers. *Int J Tuberc Lung Dis.* 2007; 11(2): 227-232.

[31]. Fauzi AR, Balakrishnan L, Rathor MY. Usefulness of cytological specimens from bronchial brushings and washings in addition to endobronchial biopsies during bronchoscopy for lung cancer: 3 years data from a chest clinic in a general hospital. *Med J Malaysia*. 2003 Dec; 58(5): 729-34.

[32]. Gellert AR, Mudd RM, Sinha G, Geddes DM. Fiberoptic bronchoscopy: effect of multiple bronchial biopsies on diagnostic yield in bronchial carcinoma. *Thorax* 1982; 37: 684–687

[33]. Minami H, Ando Y, Nomura F, Saki S, Shimokata K. Interbronchoscopist variability in the diagnosis of lung cancer by flexible bronchoscopy. *Chest* 1994; 105: 1658–1562.

[34]. Rao S, Rao S, Lal A, Barathi G, Dhanasekar T, Duvuru P. Bronchial wash cytology: A study on morphology and morphometry. *J Cytol.* 2014 Apr; 31(2):63-7.

[35]. Scagliotti GV, Parikh P, Von Pawel J, *et al*. Phase III study comparing cisplastin plus gemcitabine with cispalstin plus pemetrexed in chemotherapy-naïve patients with advanced –stage- non-small cell lung cancer. *J Clin Oncol* 2008; 26:3543-3551.

[36]. Truong LD, Underwood RD, Greenberg SD, *et al.* Diagnosis and typing of lung carcinomas by cytopathologic methods: a review of 108 cases. *Acta Cytol* 1985; 29:379-84.

[37]. Ming-Ming HU, Ying HU, JIa-Bei HE, Bao-lan LI. Primary adenoid cystic carcinoma of the lung: Clinicopathological features, treatment and results. *Oncol Lett.* 2015 Mar; 9(3):1475-81.

[38]. Kim HJ, Choi S, Kwon J, Kim JY, Park K. Bronchial brushing cytologic finding of pulmonary adenoid cystic carcinoma misinterpretated as small cell carcinoma- A case report with literature review. *Korean J Pathol*. 2011; 45(4): 441-4.