TPM Vol. 32, No. S3, 2025
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

DIAGNOSTIC YIELD OF VARIOUS BRONCHOSCOPIC SAMPLING FOR LUNG CANCER DIAGNOSIS: A RETROSPECTIVE STUDY

SUSHMITA VINOD
SENIOR RESIDENT DEPARTMENT OF RESPIRATORY MEDICINE, SAVEETHA MEDICAL COLLEGE AND HOSPITAL THANDALAM, CHENNAI, TAMIL NADU 602105

RAJAMANI KASI
MD RESPIRATORY MEDICINE (POST GRADUATE)
DEPARTMENT OF RESPIRATORY MEDICINE, SAVEETHA MEDICAL COLLEGE AND HOSPITAL, THANDALAM, CHENNAI, TAMIL NADU 602105

PRASANTH GURURAJ
ASSISTANT PROFESSOR DEPARTMENT OF RESPIRATORY MEDICINE, SAVEETHA MEDICAL COLLEGE AND HOSPITAL, THANDALAM, CHENNAI, TAMIL NADU 602105

GANGADHARAN VADIVELU

Abstract

Background: Lung cancer continues to be the primary cause of cancer related deaths around the world. Detecting the disease early and accurately is crucial for improving patient outcomes. Different techniques like bronchoalveolar lavage (BAL), bronchial brushings and biopsy are used to diagnose lung cancer through bronchoscopy. This study looks back at how effective these techniques were in diagnosing the disease.

Methodology: The analysis reviewed 62 patients suspected of having lung cancer who underwent fibreoptic bronchoscopy guided biopsy, brushings and BAL at Saveetha Medical College's Department of Respiratory Medicine. It focused on measuring the sensitivity and specificity of each bronchoscopy technique. Data was analysed using IBM SPSS Statistics 28.0.1.0 to assess how accurate each method was in diagnosing lung cancer.

Results: The study revealed that combining BAL and biopsy showed a 75% positivity for malignancy, while BAL and brushings had an 85% positivity rate, reaching up to 88% when all three techniques were combined. Using all methods together resulted in the highest sensitivity (87.50%) and accuracy (83.33%), with a positive predictive value (PPV) of 93.33%. Adenocarcinoma was identified as the most prevalent histopathological type in 68% of cases, followed by squamous cell carcinoma in 31%.

Conclusion: Utilizing BAL along with bronchial brushings and biopsy significantly boosts the ability to diagnose lung cancer effectively. In clinical settings, this combined method enhances diagnostic accuracy, playing a key role in achieving precise and timely detection of lung cancer.

Keywords*:* Lung Cancer, Bronchoscopy, Bronchoalveolar Lavage, Brush Cytology, Biopsy.

INTRODUCTION:

Lung cancer continues to pose a significant challenge to global health, being the most prevalent form of malignant disease with increasing rates of incidence and serious impacts on morbidity and mortality (1). In the early 20th century, lung tumours were rare, but in the following decades, there has been a substantial surge in cases, with a 15-fold increase in males and a 10-fold increase in females (2). Currently, lung cancer stands as the primary cause of cancer related deaths worldwide and is projected to surpass breast cancer as the leading cause of cancer fatalities among women. Smoking plays a major role, accounting for about 85% of lung cancer deaths (2). Despite ongoing efforts to promote smoking cessation, a significant decrease in incidence is not expected until 5 to 15 years after quitting (3, 4).

Detecting lung cancer early and making accurate diagnoses are essential for improving the chances of recovery for patients. Traditional methods such as assessing clinical symptoms, using chest X rays and analysing sputum samples, along with more advanced approaches like endoscopies and biopsies, are key in identifying cancerous

growths (5). Fibreoptic bronchoscopy (FOB) has emerged as a vital tool in diagnosing lung cancer by allowing direct visualisation of the tracheobronchial tree and facilitating various sampling methods (6).

Sampling techniques during bronchoscopy, like bronchial washings, brushings and bronchoalveolar lavage (BAL), are commonly used to gather important cytological material for diagnosis purposes (6). The introduction of flexible fibre optic bronchoscopes in the 1960s greatly enhanced the ability to diagnose pulmonary diseases (7). By combining various diagnostic methods such as bronchoscopy, bronchial biopsy, brushing and washing cytology, healthcare professionals can achieve optimal diagnostic results in detecting lung abnormalities (7-9).

BAL with brush involves the insertion of a small brush into the bronchoscope to collect cells lining the airway. This procedure is viewed as less intrusive than a biopsy and is often carried out in an outpatient setting, which appeals to many patients. Despite its convenience, BAL with a brush may yield fewer diagnostic results than a biopsy and sometimes may not yield sufficient cells for a conclusive diagnosis (10).

On the other hand, BAL with biopsy involves obtaining a small tissue sample from the lung using the bronchoscope. This method offers a higher diagnostic yield by providing more significant tissue samples that can result in more accurate diagnoses. Despite its benefits, BAL with biopsy is more invasive than brushing, has a higher risk of complications like bleeding and comes at a higher cost (6).

Conversely, bronchoalveolar lavage (BAL) with biopsy entails extracting a small tissue specimen from the lung through a bronchoscope. This approach enhances diagnostic accuracy by yielding more substantial tissue samples, leading to more precise diagnoses. Despite its advantages, BAL with biopsy is a more invasive procedure compared to brushing, carries an elevated risk of complications such as bleeding and is associated with higher expenses (6).

In this retrospective study, we aim to assess the diagnostic yield of various bronchoscopy sampling methods in suspected lung carcinoma patients. This assessment is important for determining the reliability and efficiency of these methods in promptly and accurately detecting lung cancer, which can lead to enhanced patient care and better treatment outcomes.

MATERIAL AND METHODS:

Study Design

This study is designed as a retrospective analysis conducted at the Department of Respiratory Medicine, Saveetha Medical College.

Study Population

The study population consisted of 62 patients who met the inclusion criteria and underwent fibreoptic bronchoscopy-guided biopsy, brush, and bronchoalveolar lavage.

Study Setting

The research was conducted in the Department of Respiratory Medicine at Saveetha Medical College, leveraging the department's expertise and facilities for advanced respiratory diagnostics.

Methods

Various bronchoscopy sampling techniques were employed to diagnose lung cancer, including:

Fibreoptic Bronchoscopy-Guided Biopsy: This procedure involves the use of a flexible bronchoscope to obtain tissue samples from the lungs. The bronchoscope is guided through the airways to the site of the suspected tumour, where a biopsy instrument is used to collect a tissue sample.

Bronchial Brush: This technique uses a brush attached to the bronchoscope to scrape cells from the bronchial walls. These cells are then examined under a microscope for the presence of cancer cells.

Bronchoalveolar Lavage (BAL): In this procedure, a saline solution is introduced into a small part of the lung and then collected for analysis. BAL fluid can provide valuable information about cellular and non-cellular components in the alveoli.

The primary outcome measures for this study were the sensitivity and specificity of these bronchoscopy techniques in diagnosing lung cancer.

Inclusion Criteria

The study involved adults aged 18 and who were able to provide informed consent. They had to have good lung function for safe bronchoscopy procedures. Also, the study focused on people showing suspicion of lung cancer, backed by symptoms and confirmed through radiological findings, especially a positive bronchus cut off sign on CT scans of the chest.

Exclusion Criteria

Patients under 18 years old or those unable to give informed consent were not included in the study. The research also excluded individuals with severe breathing difficulties necessitating high oxygen levels (SpO2 less than 60%) and those with unstable blood pressure. Additionally, pregnant women were not part of the study to prevent any potential risks linked to bronchoscopy procedures.

Statistical Analysis

The data gathered from the bronchoscopy procedures was examined to assess the effectiveness of each type of sample collection method. Sensitivity was determined by looking at the ratio of accurate positive outcomes in patients diagnosed with lung cancer, while specificity focused on the ratio of accurate negative outcomes in

patients without lung cancer. The findings were presented using various measurements such as frequency, percentage or average with standard deviation when necessary. Statistical analysis of the data was carried out using IBM SPSS Statistics 28.0.1.0.

RESULTS:

This retrospective study included 62 patients who met the inclusion criteria and underwent fibreoptic bronchoscopy-guided biopsy, brush, and bronchoalveolar lavage (BAL). The research was conducted in the Department of Respiratory Medicine at Saveetha Medical College, utilising the department's advanced facilities for respiratory diagnostics. The age distribution of the patients varied significantly, with the highest number of patients (18) falling within the 35 to 45 years age group, constituting 29.51% of the total population. This was followed by 12 patients (19.67%) aged 25 to 35 years. The 55 to 65 years age group included 11 patients (18.03%), and the 15 to 25 years age group had 8 patients (13.11%). The 45 to 55 years and 65 to 75 years age groups comprised 7 patients (11.48%) and 3 patients (4.92%), respectively. There were 2 patients (3.28%) aged over 75 years (Table 1).

Cytological Findings and Histopathological Type:

The analysis of cytological findings in BAL fluid and bronchial biopsy compared to the histopathological types in lung mass cases showed that out of 16 patients, adenocarcinoma was positive in 8 cases, ruled out in 1 case and inconclusive in 3 cases. Squamous cell carcinoma was detected in 4 cases. Looking at the cytological results from BAL fluid and brush cytology, among 13 patients, adenocarcinoma was positive in 7 cases, negative in 1 case and inconclusive in another case. Squamous cell carcinoma was positive in 4 instances. By analysing the cytological findings from BAL fluid, brush cytology and bronchial biopsy for a total of 32 patients, adenocarcinoma was positive in 20 cases, negative in 2 cases and inconclusive in another two cases. Additionally, squamous cell carcinoma was identified positively in eight instances (Table 2-4).

Diagnostic Positivity for Malignancy:

The diagnostic positivity for malignancy using various bronchoscopy techniques showed that out of 16 cases using BAL fluid and bronchial biopsy, 12 cases were positive for malignancy, resulting in a 75% positivity rate. In another set of 13 cases using BAL fluid and brush cytology, 11 cases showed positive results, resulting in an 85% positivity rate. Lastly, among the patients who underwent BAL fluid, brush cytology and bronchial biopsy together, 28 out of 32 cases indicated malignancy, leading to an 88% positivity rate (Table 5).

Cytological Findings by Techniques:

The study also compared the cytological findings by various techniques. Among 16 cases using BAL fluid and bronchial biopsy, 12 were definitively malignant, 1 was non-malignant, and 3 were suspicious for malignancy. In the 13 cases using BAL fluid and brush cytology, 11 were definitively malignant, 1 was non-malignant, and 1 was suspicious for malignancy. In the 32 cases using BAL fluid, brush cytology, and bronchial biopsy, 28 were definitively malignant, 2 were non-malignant, and 2 were suspicious for malignancy (Table 6).

The study also examined the cytological results using different methods. Out of 16 cases involving BAL fluid and bronchial biopsy, 12 were confirmed as malignant, 1 was non-malignant and 3 were potentially indicative of malignancy. In the 13 cases with BAL fluid and brush cytology, 11 were determined to be malignant, 1 was non-malignant and 1 was possibly suspicious of malignancy. For the 32 cases that utilized BAL fluid, brush cytology and bronchial biopsy together, 28 showed clear signs of malignancy, while 2 were non-malignant and another 2 raised suspicions of malignancy (Refer to Table 6).

Incidence of Various Types of Lung Tumours:

The incidence of various types of lung tumours showed that adenocarcinoma was the most common type, identified in 35 cases (68%). Squamous cell carcinoma was present in 16 cases (31%) (Table 7).

Combined Predictive Validity of Cytology:

The combined predictive validity of cytology for various techniques was evaluated. For BAL fluid and bronchial biopsy, the sensitivity was 75%, specificity 25%, positive predictive value (PPV) 80%, negative predictive value (NPV) 20%, accuracy 65%, false positive rate (FPR) 75%, and false negative rate (FNR) 25%. Using BAL fluid and brush cytology, the sensitivity was 84.62%, specificity 50%, PPV 91.67%, NPV 33.33%, accuracy 80%, FPR 50%, and FNR 15.38%. Finally, using BAL fluid, brush cytology and bronchial biopsy, the sensitivity was 87.50%, specificity 50%, PPV 93.33%, NPV 33.33%, accuracy 83.33%, FPR 50%, and FNR 12.50% (Table 8).

DISCUSSION

Lung cancer continues to pose a significant health challenge globally, being the most prevalent form of malignant disease with rising incidence rates and high levels of morbidity and mortality (1). While lung tumours were once uncommon, there has been a substantial increase in cases over the past few decades, particularly with a 15 -old rise in males and a 10-fold increase in females (2). Poorly differentiated anaplastic lesions are characterized by cells that are less cohesive than those in well differentiated lesions, leading to increased cell shedding into the bronchial cavity, which can aid in diagnosis (11-13). However, these shed cells may undergo degenerative changes

while situated in the bronchus, making it challenging to distinguish them from non-malignant cells shed by the normal bronchial lining. Although bronchoalveolar lavage (BAL) has relatively low sensitivity at 21.57% compared to other methods, its minimally invasive nature and potential for improved yield through multiple samplings make it a valuable diagnostic tool (14). Bronchial brush cytology and washings offer varying sensitivity levels ranging from 21% to 93%, providing not only increased cellular yield but also better preservation of cellular morphology details (14).

The present study aimed to assess the diagnostic yield of different bronchoscopy sampling methods, such as bronchoalveolar lavage (BAL), brush cytology and bronchial biopsy in diagnosing lung cancer. The findings highlight the differential effectiveness of these techniques individually and in combination, underscoring the importance of a comprehensive diagnostic approach in respiratory medicine. The age distribution of the participants in the study indicated a higher number of middle-aged individuals, especially those aged between 35 and 45 years, making up around 30% of the total patients. This aligns with the typical age range for lung cancer diagnoses, which are more common among middle aged and older adults. The demographic characteristics observed in this study mirror global patterns, highlighting the importance of tailored screening and diagnostic methods for these age groups.

When analysing cytological findings, the combination of BAL and bronchial biopsy showed a diagnostic positivity rate of 75% for detecting malignancy. This rate increased to 85% when BAL was paired with brush cytology and further rose to 88% when all three techniques were utilised together. These findings underscore the benefits of employing multiple sampling methods to improve diagnostic precision. This discovery is consistent with a study by Akhilesh Tiwari et al., which suggested that combining BAL and brush cytology can be as effective as bronchial biopsy in identifying lung masses, with brush cytology showing a sensitivity of 52.94% and BAL at 21.57% (15). The highest positivity rate observed through the combined use of BAL fluid, brush cytology and bronchial biopsy indicates that this comprehensive approach enhances the chances of detecting malignancies, thereby advancing patient outcomes through prompt and accurate diagnosis. Patel Chauhan and Shah also noted that endobronchial biopsy yielded the highest diagnostic success at 87.8%, emphasising the crucial role played by integrating various bronchoscopy techniques in precise lung cancer diagnosis (16).

The study also highlighted the diagnostic accuracy parameters like sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy, false positive rate (FPR) and false negative rate (FNR) for the various sampling methods. Notably, the combination of BAL, brush cytology and bronchial biopsy showed the highest sensitivity (87.50%) and accuracy (83.33%) with a commendable PPV of 93.33%. These figures highlight the strength of this thorough diagnostic approach in pinpointing lung cancer with great accuracy. Similarly, Kotadia et al. Highlighted the efficacy of pulmonary cytology in early detection of lung cancer, though their results revealed a different distribution of cancer types, with squamous cell carcinoma being predominant (10). In comparing our study's findings with those of previous research, it is evident that the combination of various bronchoscopic techniques improves both the accuracy and effectiveness of diagnosis. For example, Jofy George and Umashankar T discovered that bronchial brush cytology showed a sensitivity of 59.28% and specificity of 100%, whereas BAL had a sensitivity of 51% and specificity of 100%. This underscores the significance of utilising both methods together to enhance diagnostic precision for pulmonary lesions (17). Khadiga S.M. Salamaa et al. Reported that BAL yielded positive results in 42.4% of cases, boosting the overall positive outcomes from bronchoscopy by 13.9%, particularly in peripheral lesions and larger masses (18). These earlier findings are consistent with our own, emphasising the importance of employing multiple bronchoscopy sampling techniques to optimise diagnostic outcomes.

The study's findings highlight the significance of using a combination of techniques during bronchoscopy sampling to enhance the accuracy of diagnosing lung cancer. By incorporating procedures like BAL, brush cytology and bronchial biopsy simultaneously, healthcare providers can achieve better sensitivity and precision levels, resulting in more dependable diagnoses and improved patient outcomes. This integrated approach is especially important in clinical settings to minimise inconclusive findings and boost clinicians' confidence in their diagnostic skills. The study's notable high positivity rates and strong diagnostic parameters endorse the adoption of a multimodal strategy that is crucial for prompt and precise diagnosis, ultimately benefiting the treatment and care of individuals with lung cancer.

CONCLUSION:

This study emphasises the valuable diagnostic advantages of combining BAL, brush cytology and bronchial biopsy for diagnosing lung cancer. The increased diagnostic accuracy and effectiveness seen with this comprehensive approach highlight its potential to enhance early detection and treatment outcomes for patients with lung cancer. Future research should concentrate on larger, multi centre studies to confirm these results and investigate incorporating advanced diagnostic technologies like molecular profiling to supplement traditional

cytological methods. This will pave the way for more precise and personalized diagnostic strategies in lung cancer care.

REFERENCES:

1. Ahn JH. An update on the role of bronchoscopy in the diagnosis of pulmonary disease. Yeungnam Univ J Med. 2020;37(4):253-61. doi: 10.12701/yujm.2020.00584.
2. Parker SL, Tong T, Bolden S, Wingo PA. Cancer statistics, 1997. CA Cancer J Clin. 1997;47(1):5-27. doi: 10.3322/canjclin.47.1.5.
3. Health benefits of smoking cessation : a report of the Surgeon General. 1990.
4. Magrath I, Litvak J. Cancer in developing countries: opportunity and challenge. J Natl Cancer Inst. 1993;85(11):862-74. doi: 10.1093/jnci/85.11.862.
5. Ikeda S, Tsuboi E, Ono R, Ishikawa S. Flexible bronchofiberscope. Jpn J Clin Oncol. 2010;40(9):e55-64. doi: 10.1093/jjco/hyq114.
6. Akhilesh T, J K, G N, Amrita G, Deepak S. Comparison of safety, efficacy and diagnostic value of bronchoalveolar lavage, brush cytology vs endobronchial lung biopsy in lung masses. The Journal of Community Health Management. 2021;2021:13777. doi: 10.18231/j.jchm.2021.005.
7. Kocjan G, Gray W, Levine T, Kardum-Skelin I, Vielh P. Diagnostic Cytopathology Essentials: Expert Consult: Online and Print: Elsevier Health Sciences; 2013 2013.
8. Koss LG, Melamed MR. Koss' Diagnostic Cytology and Its Histopathologic Bases: Lippincott Williams & Wilkins; 2006 2006.
9. Cibas ES, Ducatman BS. Cytology E-Book: Diagnostic Principles and Clinical Correlates: Elsevier Health Sciences; 2019 2019.
10. Kotadia TP, Jasani JH, Vekaria PN. Comparison of bronchial biopsy, broncho alveolar lavage (BAL), brush cytology and imprint cytology in suspected cases of lung cancer. Int J of Biomed & Adv Res. 2013;4(9):579-84. doi: 10.7439/ijbar.v4i9.453.
11. Truong LD, Underwood RD, Greenberg SD, McLarty JW. Diagnosis and typing of lung carcinomas by cytopathologic methods. A review of 108 cases. Acta Cytol. 1985;29(3):379-84. Epub 1985/05/01. PubMed PMID: 3859139.
12. Kumar VA, Abul K; Fausto, Nelson; Robbins, Stanley L; Cotran, Ramzi S;. Robbins and Cotran pathologic basis of disease: Elsevier Saunders; 2005.
13. Bandyopadhyay D, Panchabhai TS, Bajaj NS, Patil PD, Bunte MC. Primary pulmonary artery sarcoma: a close associate of pulmonary embolism-20-year observational analysis. J Thorac Dis. 2016;8(9):2592-601. Epub 2016/10/18. doi: 10.21037/jtd.2016.08.89. PubMed PMID: 27747013; PubMed Central PMCID: PMCPMC5059338.
14. Chopra SK, Genovesi MG, Simmons DH, Gothe B. Fiberoptic bronchoscopy in the diagnosis of lung cancer comparison of pre-and post-bronchoscopy sputa, washings, bruchings and biopsies. Acta Cytol. 1977;21(4):524-7.
15. Gurlevik A, Ürkmez S, Utku T, Dikmen Y. Comparison of Bronchoalveolar Lavage and Protected Mini-Bronchoalveolar Lavage in Diagnosis of Pneumonia in Intensive Care Unit. Journal of Anesthesia & Critical Care: Open Access. 2017;7.
16. Patel KM, Chauhan BA, Shah NT. Lung cancer diagnosis by bronchoscopy at tertiary care center: A retrospective analysis. Ind J Respir Care. 2022;11(4):358-62. doi: 10.4103/ijrc.ijrc_92_22.
17. George J, Umashankar. Diagnostic utility of bronchoalveolar lavage and bronchial brush cytology in lung lesions. Ann Pathol Lab Med. 2020;7(8):A394-9. doi: 10.21276/apalm.2710.
18. Salama KSM, Hafez MR, Farag AS, Salim DLA. Bronchoalveolar lavage in lung cancer: does it increase the positive yield of bronchoscopy? The Egyptian Journal of Chest Diseases and Tuberculosis. 2023;72(3):326. doi: 10.4103/ecdt.ECDT_88_22.

Authors contribution:

Rajamani Kasi and Gangadharan Vadivelu have been involved in drafting the manuscript. Sushmita Vinod had revised the manuscript. Rajamani, Sushmita Vinod, and Prasanth Gururaj have participated in surgical care and follow ups. All authors have given final approval of the version to be published.

Acknowledgement:

The authors wish to express their gratitude to Dr. Kevin Kumar Vijayakumar, M. Tech., Ph.D., from GRACE POLYCLINIC, Madurai, for his guidance and support during the preparation of this manuscript.

Conflict of Interest:

No conflict of interest

Funding:

All authors have declared that no financial support was received from any organization for the submitted work.

Tables:

Table 1: Age distribution	

Age	No. of patients	Percentage %
15 - 25	8	13.11%
25 - 35	12	19.67%
35 - 45	18	29.51%
45 - 55	7	11.48%
55 - 65	11	18.03%
65 - 75	3	4.92%
75 >	2	3.28%
	61	100.00%

Table 2: Comparison of cytological finding of BALF (BAL fluid) and bronchial biopsy with histopathological type in lung mass cases

Histopathological Type	Positive	Negative	Inconclusive
Adenocarcinoma	8	1	3
Squamous Cell	4		
Total	16 PATIENTS		

Table 3: Comparison of cytological finding of BALF (BAL fluid) and Brush cytology with histopathological type in lung mass cases

Histopathological Type	Positive	Negative	Inconclusive
Adenocarcinoma	7	1	1
Squamous Cell	4		
Total	13 PATIENTS		

Table 4: Comparison of cytological finding of BALF (BAL fluid), Brush cytology, and bronchial biopsy with histopathological type in lung mass cases

Histopathological Type	Positive	Negative	Inconclusive
Adenocarcinoma	20	2	2
Squamous Cell	8		
Total	32 PATIENTS		

Table 5: Diagnostic positivity for malignancy by various bronchoscopy techniques

	Total No. Cases	Positive for malignancy no of cases	Percentage of Positive for malignancy no of cases
BALF (BAL fluid) + bronchial biopsy	16	12	75%
BALF (BAL fluid) + Brush cytology	13	11	85%
BALF (BAL fluid) + Brush cytology + bronchial biopsy	32	28	88%

Table 6: Cytological findings by various techniques

S. No	CATEGORY	BALF (BAL fluid) + bronchial biopsy n=16	BALF (BAL fluid) + Brush cytology n=13	BALF (BAL fluid) + Brush cytology + bronchial biopsy n=32

1	Definitive malignancy	12	11	28
2	Non malignant	1	1	2
3	Suspicious for malignancy	3	1	2

Table 7: Incidence of various types of lung tumours

S. No	Type of tumour	No of cases	Percentage %
1	Adenocarcinoma	35	68%
2	Squamous Cell	16	31%
	Total	51	100%

Table 8: Combined predictive validity of cytology

	Sensitivity	Specificity	PPV	NPV	Accuracy	FPR	FNR
BALF (BAL fluid) + bronchial biopsy	75.00%	25.00%	80.00%	20.00%	65.00%	75.00%	25.00%
BALF (BAL fluid) + Brush cytology	84.62%	50.00%	91.67%	33.33%	80.00%	50.00%	15.38%
BALF (BAL fluid) + Brush cytology + bronchial biopsy	87.50%	50.00%	93.33%	33.33%	83.33%	50.00%	12.50%