

A study on usefulness of cbaat in Bal sample in sputum smear negative Patients

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Abstract

Background: More recently, with the advent of the flexible fiber optic broncho scope (FOB), a more aggressive approach to investigation has been adopted in such patients in an attempt to diagnose tuber culosis at an earlier stage in its natural history⁷Among the broncho scopic materials, bronchoalveolar lavage (BAL) is the best diagnostic material for the diagnosis of PTB³⁻⁵. The advantage of making early diagnosis is, it prevents morbidity, progression & spread of the disease and lung damage by fibrosis.

Methods: This study was undertaken with the approval of the Institutional Ethics Committee of S.P. Medical College and PBM Hospital, Bikaner, and written informed consent was obtained from each participant prior to participation in the study and the sample collection process. All subjects were evaluated by taking a detailed clinical history.

Results: In our study Between BAL AFB smear and GeneXpert, the sensitive test for PTB was BAL GeneXpert. Specificity of 71.00% were observed in both

types of diagnosis i.e., BAL AFB smear and Gene Xpert had a good diagnostic value. According to accuracy (to find out true positive and true negative) BAL GeneXpert was the better test for screening and diagnostic purpose.

Conclusion: GeneXpert and AFB smear microscopy share almost same specificity but sensitivity of Gene Xpert is much higher than AFB smear microscopy in respiratory samples as shown in our study.

Keywords: BAL, PTB, AFB.

Introduction

The World Health Organization Global TB Report provides a comprehensive and up-to-date assessment of the TB epidemic, and progress in the response, at global, regional and country levels.

The 2022 edition features data on disease trends and the response to the epidemic from 215 countries and areas, including all 194 World Health Organization (WHO) Member States.

It provides a comprehensive and up-to-date assessment of the TB epidemic, progress in the response at global, regional and country levels, as well as on the impact of

the COVID-19 pandemic on TB services. TB remains one of the top infectious killers in the world. This year's report presents data on an increase in the number of people falling ill with TB and drug resistant TB for the first time in many years.

Increases were also reported on the number of TB deaths, highlighting the severe impact of the COVID-19 pandemic and other crises on the TB response that has reversed years of progress.

Newer diagnostic tests like Cartridge Based Nucleic Acid Amplification Test (CB-NAAT) [GeneXpert] and / or Line Probe Assay (LPA) are the novel integrated tests for the diagnosis of tuberculosis and rapid detection of RIF and INH resistance in pulmonary and extrapulmonary specimens obtained from possible tuberculosis patients²

The turnaround time for the results by LPA is around 72 hours and by CBNAAT is around 2 hours¹⁰

It is important, in this era of evidence-based medicine, to bacterio logically or histologically confirm diagnosis of tuberculosis by all possible and plausible methods. In the process of establishing the diagnosis, there is fair possibility in ending up with other diagnoses, which would be delayed in the process of empiric ATT and observation. More recently, with the advent of the flexible fiber optic bronchoscope (FOB), a more aggressive approach to investigation has been adopted in such patients in an attempt to diagnose tuberculosis at an earlier stage in its natural history⁷

Among the broncho scopic materials, bronchoalveolar lavage (BAL) is the best diagnostic material for the diagnosis of PTB³⁻⁵. The advantage of making early diagnosis is, it prevents morbidity, progression & spread of the disease and lung damage by fibrosis.

Materials and methods

Study design: Hospital based Prospective observational study.

Study duration: 6 months

Study place

Department of Respiratory medicine, S.P. Medical College and P.B.M Hospital, Bikaner

Sample size

Sample size was calculated at 95% confidence interval to verify an expected 25% proportion of sputum smear negative Patients at 10% precision / absolute allowable error. Sample size was calculated using the formula for sample size for estimation of proportion –

$$N = \frac{Z_{1-\alpha/2}^2 P (1 - P)}{E^2}$$

Sample size was calculated to be to be minimum 75 subjects which was enhanced and rounded off to 100 subjects.

Inclusion Criteria

- All patients with two consecutive sputum smear examinations negative for acid-fast bacilli.
- All patients with clinico- radio logically findings suggestive of pulmonary tuberculosis

Exclusion Criteria

- Patients with any contra indications for broncho scopy procedure
- Those not giving consent and patients on anti – tuber cular treatment

Data Collection

Detailed clinical history was obtained thorough physical examination and routine investigations, assessment for the fitness of patients for broncho scopy procedure was done. Written informed consent was obtained from all the patients undergoing broncho scopy procedure. Fibroptic broncho scopy was performed using Olympus IT BF 150 bronchoscope introduced through trans nasal/oral route after proper lubrication with xylocaine ointment.

Lignocaine 2% was used as local anesthesia to anesthetized vocal cords and bronchial tree. The lung section samples was chosen based on chest X-ray or CT-scan abnormalities. BAL samples was obtained after instillation of 10-50 ML isotonic saline using 10 ml disposable syringe with bronchoscope wedged in a segmental or sub-segmental bronchus and then aspirated. BAL samples thus obtained will then analyzed by CBNAAT.

Results

Table 1: General characteristics

Variable	Tuberculosis	Non-Tuberculosis	p-value
Age in yrs	42.10±14.06	36.32±15.02	0.263
Male : Female	53:29	11:7	0.123
Mean total duration of illness (days)	75.23± 70.12	60.12±51.36	0.578

Table 2: Diagnostic yield of different tests for diagnosis of Tuberculosis

Test	Diagnosed as TB(N)
BAL AFB culture (Gold standard)	80
BAL AFB Smear	28
GeneXpert	57

Diagnosis of tuberculosis was established in 80 (80%) patients out of 100 cases.

Table 3: Gross findings of broncho scopy.

Gross finding	Tuberculosis		Non-tuberculosis	
	No	%	No	%
Secretions	40	50.00	8	40.00
Haemorrhage	6	7.50	0	0.00
Hyperaemic	34	42.50	8	40.00
Normal	32	40	7	35.00

Above Table shows the gross findings noted by bronchoscopic examination of bronchial mucosa. Presence of secretions was the most common finding noted in 48% of patients followed by hyperaemia in 42%. Presence of secretions was found in 50% of the patients of PTB. However, there was no significant association between the groups.

Table 4: Comparison of BAL AFB smear & Gene Xpert in diagnosis of PTB

Diagnostic parameter %	BAL AFB	BAL GeneXpert	P Value
Sensitivity	32.00	72.00	0.001
Specificity	90.00	71.00	0.816
Positive predictive value (PPV)	92.00	92.00	0.151
Negative predictive value (NPV)	26.00	40.00	0.623
Diagnostic accuracy	48.00	73.00	0.001

P value was calculated using Chi-square test

In our study Between BAL AFB smear and Gene Xpert, the sensitive test for PTB was BAL Gene Xpert. Specificity of 71.00% were observed in both types of diagnosis i.e. BAL AFB smear and Gene Xpert had a good diagnostic value. According to accuracy (to find out true positive and true negative) BAL Gene Xpert was the better test for screening and diagnostic purpose.

Discussion

Studies with similar results

Table 5:

S.No.	Study	Sensitivity	Specificity	PPV	NPV
1.	Pierraeetal ⁶	25%	95.8%	45.5%	90.1%
2.	Dewaldetal ⁷	41%	98.6%	94.1%	75.8%
3.	Kanwaletal ⁸	39.53%	100%	100%	11.86%
4.	Present study	35%	90%	93.3%	25.7%

This correlates with the WHO reported sensitivity of Gene Xpert in 70-100% among culture positive and around 60% in those with smear negative and specificity ranging from 91-100%.

Similar studies in the past which correlates with our study.

Table 6:

S. No	Study	Sensitivity	Specificity	PPV	NPV
1.	Agarwaletal ⁹	86.8%	93.1%	78.5%	96%
2.	Piirraetal ⁶	80%	98.6%	88.9%	97.2%
3.	HY Leeetal ¹⁰	81.6%	100%	100%	97.1%
4.	Kanwaletal ⁸	91.86%	71.42%	97.53%	41.6%
5.	Sharmaetal ¹¹	90%	100%	100%	98.1%
6.	Present study	72.5%	70%	90.6%	38.9%

However, the sensitivity and positive predictive value of Xpert MTB/RIF assay to detect MTB was very high (72.5% and 90.6% respectively), while the specificity and negative predictive value in this study was low (70% and 38.9%) as compared to the international studies (100% and 92.1% respectively) ^{122,125} Possible explanations include false positive tests in the presence of a negative culture, or laboratory error. Hence, GeneXpert assay had a sensitivity in BAL sample of 72.5% for PTB, which is superior to that of smear microscopy BAL 35%, which correlate well with other studies. Our study was one such effort which highlighted the usefulness of BAL Gene Xpert as a more sensitive investigation in comparison to smear microscopy in the rapid diagnosis of smear negative cases.

Conclusion

GeneXpert and AFB smear microscopy share almost same specificity but sensitivity of GeneXpert is much higher than AFB smear microscopy in respiratory samples as shown in our study.

Although culture is considered as a gold standard method, it takes weeks to get the result and simultaneous

detection of Rifampicin resistance is not possible with it.

On other hand, GeneXpert has the advantage of rapidity, cost-effectiveness and less man power involved in the diagnosis of smear negative pulmonary tuberculosis.

However, GeneXpert does not eliminate the need of culture and anti-tubercular drug sensitivity that are required in the confirmation of diagnosis and to detect resistance to drugs other than Rifampicin.

In a resource limited setting with high case burden, a positive GeneXpert, owing to its simplicity, sensitivity and automation, can serve as a useful adjunct for the diagnosis of PTB in BAL specimens of smear negative PTB suspects.

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