



The Value of Post-bronchoscopic Sputum Examination in the Diagnosis of Smear-Negative Pulmonary Tuberculosis

Kanok Pipatvech M.D. *
Sumalee Kiatboonsri M.D. *
Viboon Boonsarngsuk M.D. *
Poonpilas Hongmanee M.Sc.**
Sabaitip Choothakan B.Sc.*

*Division of Pulmonary and Critical Care Medicine, Department of Medicine, Ramathibodi Hospital

** Division of Microbiology, Department of Pathology, Ramathibodi Hospital

Abstract

Background: The sensitivity of sputum and bronchoalveolar lavage (BAL) for diagnosis of pulmonary tuberculosis (PTB) is low.

Objective: To evaluate the value of sputum obtained post-bronchoscopically in the detection of AFB (smear and culture), with particular comparison to the standard pre-bronchoscopic culture, BAL and transbronchial biopsy (TBB).

Method: Thirty-five active PTB patients (diagnosed clinically and radiologically) with 3 negative consecutive sputum AFB smears were recruited. Some of the sputums were also cultured. All patients underwent fiberoptic bronchoscopic examinations (FOB) with BAL and TBB performed from the indicated segments. The BAL specimens were processed for AFB stains and C/S. Post-bronchoscopic cultures patients were asked to expectorate 3 consecutive sputums for examinations (smear and C/S). Final diagnosis of PTB was defined as a recovery of AFB (smear \pm C/S) at any step of the diagnostic procedures. In cases with negative AFB recovery, active PTB was diagnosed only if definite clinical plus radiologic improvement after chemotherapy was evidenced.

Results: Of the thirty-five patients participated in this study, PTB was diagnosed in eighteen patients. The addition of post-FOB sputum smear alone did not increase the sensitivity over group 2 ($p=0.11$). The sensitivity of group 3 (72%) was higher than that of group 1 (30%, $p=0.03$) and that of group 2 (61%, $p=0.016$). No statistically difference was seen between group 1 and 2 ($p=0.28$).

Conclusion: The addition of post-bronchoscopic sputum culture to BAL examination and TBB increased the sensitivity of PTB detection in sputum smear-negative PTB patients.

Introduction

Despite the development of effective chemotherapy, pulmonary tuberculosis (PTB) remains a leading health problem in the world. Since more than half of the PTB treated patients are smear-negative. The investigation for diagnostic PTB differs between countries, depending on the prevalence, economic status.¹ In the region of high PTB prevalence, when the clinical diagnosis of PTB is likely, empirical treatment is the best course of action. Bronchoalveolar lavage (BAL) being reserved for further investigation of non-responders.² Although a definitive diagnosis of PTB needs a positive culture (C/S) result³, the diagnostic sensitivity of bronchoalveolar lavage (BAL) has yet remained low⁴, presumably due to interference of mycobacterial growth caused by lidocaine.⁵ Then The advantage of the post-bronchoscopy sputum collection over the bronchoscopic aspirate as a source of viable tubercle bacilli is thus due to the inhibitory action of the topical anaesthesia.⁶

The purpose of this study were to evaluate the value of sputum obtained post bronchoscopically (post-FOB) in the detection of tuberculosis, in comparison with results from the standard pre-FOB sputum culture (C/S), BAL and transbronchial lung biopsy (TBB).

Materials and Methods

This cross-sectional study was conducted in the adult patients underwent diagnostic PTB during February-October 2005 in Division of Pulmonary and Critical Care, Ramathibodi Hospital. The study was reviewed and approved by the Committee of the Ethics in Human Research of Ramathibodi Hospital, Mahidol University.

Subjects

All patients who was suspected of PTB by clinical and radiography (CXR) with 3 negative consecutive sputum acid fast bacilli (AFB) smears were included in the study.

All subjects must not meet the exclusion criteria of bronchoscopic contraindication.

Study Design

Some of the sputums were also cultured. All patients underwent bronchoscopic examinations with BAL and TBB, performing from the indicated segments. The BAL specimens were processed for AFB stains and cultures. Postbronchoscopically, patients were asked to expectorate 3 consecutive sputums for examinations (smear and culture). Final diagnosis of PTB was defined as a recovery of AFB (smear \pm culture) at any step of the diagnostic procedures. In cases with negative AFB recovery, active PTB was diagnosed only evidences of definite clinical *plus* radiologic improvement post chemotherapy.

Bronchoalveolar Lavage Technique

In this study, BAL technique was performed according to technical recommendation and guideline for BAL procedure of ATS (American Thoracic Society) in 1990 and ERS (European Respiratory Society)

Definite Diagnosis of PTB

1. Sputum culture for TB +ve or
2. BAL culture for TB +ve or
3. TBB : granuloma or

4. Smear-negative patients who responded to anti-TB drug by improvement of clinical and CXR.

Statistical Analysis

The statistical analyses were performed by SPSS statistical software. Categorical data was reported as percentage and continuous data was reported as mean \pm SD. Comparisons of baseline characteristics were done between two groups of PTB patients. Chi-squared test or Fisher's exact test was used for categorical data. Student's

t-test or Mann-Whitney U test for continuous data. A *p*-value less than 0.05 was considered statistically significant.

Results

There were 35 patients participating in this study. PTB was diagnosed in 18 patients by definite criteria. Baseline characteristics and symptoms of patients were described in Table 1. Final diagnosis of PTB after various diagnostic tests were shown in Table 2.

Table 1 Baseline characteristics of subjects with suspected pulmonary tuberculosis

Characteristics	N(%)
Age, mean (SD)	53 (15.5)
Sex, male	23 (65.7)
Previous TB	3 (8.5)
Underlying disease	15 (42.9)
DM	4 (11.4)
Renal failure	6 (17.1)
IHD	6 (17.1)
Malignancy	3 (8.5)
Oral steroids therapy	3 (8.5)
Immunosuppressive drug	3 (8.5)
COPD	2 (5.7)
History of TB contact	2 (5.7)
Symptom	25 (71.4)
Fever	7 (20)
Weight loss	5 (14.2)
Cough	21 (60)
Hemoptysis	3 (8.5)
Chest pain	1 (2.8)

Table 2 Result from various diagnostic tests*

Method	Obtained diagnosis of TB	
	Yes (%)	No (%)
Group 1 Pre-FOB sputum culture (n=10)	3 (30)	7 (70)
Group 2 BAL specimen + TBB (n=18)	11 (61)	7 (39)
Group 3 Post-FOB sputum culture (n=18)	13 (72)	5 (28)

* Fourteen patients did not meet the criteria of definite PTB. Two patients were diagnosed infected bronchiectasis. One patient was diagnosed lung cancer. Ten patients had positive post-FOB sputum smear and culture.

The addition of post-FOB sputum smear in 18 patients did not increase the sensitivity over group 2 ($p=0.11$). The sensitivity of group 3 (72%) was higher than that of group 1 (30%, $p=0.03$) and that of group 2 (61%, $p=0.016$). No statistically difference was seen between group 1 and 2 ($p=0.28$).

Discussion

Sputum smear-negative PTB is a paucibacillary condition and dilution of epithelial lining fluid by the instilled saline might response for the low yield for BAL specimen.⁶

Charn and colleague studied the sensitivity of BAL smear had low (14%)⁴, the addition of postbronchoscopic sputa increased yield in the diagnostic test⁷, according to our study.

Our study has two main limitations. First, there was small sample size. Second, the site of BAL sampling may be inaccurate.

Conclusion

The addition of post-bronchoscopic sputum culture to FOB increased the sensitivity of PTB detection in smear-negative patients.

Reference

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บทคัดย่อ: กนก พิพัฒน์เวช*, สุมาลี เกียรติบุญศรี*, วิบูลย์ บุญสร้างสุข*, พูนพิลาส หงษ์มณี**, สไบทิพย์ จุฑะกาญจน์*. การเก็บเสมหะหาเชื้อวัณโรคหลังส่องกล้องหลอดลมในผู้ป่วยวัณโรคปอดที่เสมหะเป็นลบ วารสารวัณโรค โรคทรวงอก และเวชบำบัดวิกฤต 2551; 29:45-50.

* หน่วยโรคระบบหายใจและเวชบำบัดวิกฤต ภาควิชาอายุรศาสตร์ โรงพยาบาลรามธิบดี

** หน่วยจุลชีววิทยา ภาควิชาพยาธิวิทยา โรงพยาบาลรามธิบดี

วัตถุประสงค์: เพื่อประเมินคุณค่าของการตรวจเสมหะซึ่งได้ภายหลังการส่องกล้องหลอดลมในการวินิจฉัยวัณโรคปอดเปรียบเทียบกับวิธีการเพาะเชื้อจากเสมหะ, น้ำล้างหลอดลมถุงลม และการตัดชิ้นเนื้อปอด

วิธีการศึกษา: ผู้ป่วย 35 รายที่เป็นวัณโรคปอดเก็บเสมหะยอม AFB ไม่พบเชื้อ ซึ่งวินิจฉัยโดยใช้อาการทางคลินิกและภาพทางรังสีวิทยาที่เข้าได้กับวัณโรคปอด มีการเก็บเสมหะเพาะเชื้อวัณโรคก่อนและให้ผู้ป่วยทุกรายได้รับการส่องกล้องหลอดลมส่งตรวจยอม AFB, เพาะเชื้อร่วมกับการตัดชิ้นเนื้อปอด หลังจากนั้นเก็บเสมหะ 3 วันหลังส่องกล้องหลอดลม ส่งตรวจ AFB, เพาะเชื้อ การวินิจฉัยว่าเป็นวัณโรคปอดนั้นอาศัยการตรวจพบ AFB และการเพาะเชื้อวัณโรคเป็นผลบวก ส่วนรายที่ตรวจไม่พบจาก AFB นั้นอาศัยจากอาการทางคลินิกและภาพทางรังสีวิทยาที่ดีขึ้นหลังจากได้รับยาต้านวัณโรค

ผลลัพธ์: ผู้ป่วย 35 รายได้เข้าร่วมในการศึกษา 18 รายได้รับการวินิจฉัยว่าเป็นวัณโรคปอด การเก็บเสมหะยอม AFB หลังส่องกล้องหลอดลมไม่เพิ่มความไวเมื่อเทียบกับกลุ่ม 2, ความไวของกลุ่ม 3 (72%) มากกว่ากลุ่ม 1, 2 (30, 61%) อย่างมีนัยสำคัญทางสถิติ ($P=0.03, 0.016$) ตามลำดับ

สรุป: การเก็บเสมหะเพาะเชื้อหลังจากส่องกล้องหลอดลมร่วมกับการตัดชิ้นเนื้อปอดเพิ่มความไวในการวินิจฉัยวัณโรคปอดในผู้ป่วยวัณโรคปอดที่ตรวจไม่พบเชื้อ