

Comparison of Sputum Culture and Protected Brush Biopsy Specimen Culture through Fiberoptic Bronchoscope in Lower Respiratory Tract Infections - A Hospital based Study

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ABSTRACT

Introduction: The sputum remains the most common diagnostic specimen for isolating the causative microbes from the infected lung in spite of its proved poor yield of the true pathogens and too often findings of false pathogens. The sputum from the lung tissue passes to bronchi, trachea, larynx, hypopharynx, pharynx, nasopharynx and oral cavity where it is subsequently contaminated by addition of secretions from respective sites. Various methods have been evolved to reduce the method of contamination of sputum in order to improve the culture results. The aim of present study is to compare pre-bronchoscopic sputum culture results with those of protected brush biopsy specimens obtained by fiberoptic bronchoscope in lower respiratory tract infections.

Materials and methods: The present study was conducted on 40 cases of lower respiratory tract infections. All the patients were admitted to Chest and T.B.Hospital attached to Govt. Medical College, Patiala. The patients showed features of chronic bronchitis, bronchiectasis and pneumonias both clinically and radiographically were included in the study. The written consent of the patients was obtained and various investigations like sputum for A.F.B, Hb, TLC, DLC, urine, Blood urea and fasting blood sugar was carried out. The clinical information was recorded and clinical examination performed. Sputum samples and brush biopsy samples were obtained by bronchoscope and cultures. The results were arranged in a tabulated form and analysed.

Result: Out of these 40 patients 36 patients (90%) were suffering from bronchiectasis, 3 patients (7.5%) were of pneumonia and 1 patient (2.5%) of chronic bronchitis. Table-1 shows that in 39 cases, bronchoscopy was done by transnasal approach and in 1 patient it was done by transoral approach.

Conclusion: It can be concluded from the above study that fiberoptic bronchoscopic use with protected brush specimen reduces the incidence of contamination and gives better results for anaerobic infections of lower respiratory tract as compared to sputum culture.

Keywords: Aerobic, Anaerobic, PBC, Robertsen Cooked Meat Medium, Fiberoptic bronchoscopy.

of sputum culture only, patients may be wrongly treated.

Out of LRTI, the incidence of community acquired pneumonia is 1-10/lac of population. Elderly patients are more likely to acquire pneumonia in hospitals. It was called as captain of men of death. Ninety percent of total deaths occur in developing countries among children due to pneumonia.² There is much evidence that Haemophilus influenzae, Pneumococci are most frequent pathogens in chronic bronchitis which are commonly isolated from mouth and pharynx. Those who do not have any respiratory ailment and these oro-pharyngeal secretions mask the bacteriology of lower respiratory tract.³ Staphylococci are present normally in nasal cavities and in mouth; oral flora consists of streptococcus viridians. Non pathogenic bacteria like species are also found in patients with poor oral hygiene and artificial dentures. The species and viridians group of streptococci predominate in pharynx as in mouth. Certain pathogenic bacteria are so frequently found in oropharynx of normal persons, that they too must be considered a part of normal bacterial flora.

Various methods have evolved to reduce the contamination and thus reaching accurately near the bacterial diagnosis. The sputum from the lung tissue passes to bronchi, trachea, larynx, hypopharynx, pharynx, nasopharynx and oral cavity where it is subsequently contaminated by secretions from respective sites. Various methods have been evolved to reduce the method of contamination of sputum in order to improve the culture results. Various methods have been evolved like sputum wash technique, transtracheal aspiration, bronchial swabbing with the use of rigid bronchoscope and fiberoptic bronchoscope.⁴ Sputum examination was considered unreliable, therefore attempts have been made to obtain

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INTRODUCTION

The respiratory tract at the level of cricoid cartilage is divided into upper and lower respiratory tract. The lower respiratory tract infections (LRTI) pneumonia, chronic bronchitis, and bronchiectasis are caused by bacteria, fungi, viruses or protozoa. The sputum remains the most common material for isolating the causative microbes from the infected lung in spite of its proved poor yield of the true pathogens and too often findings of false pathogens.¹ When treated on the basis

material from bronchi by cutting of the upper respiratory passages usually through bronchoscopy. The quantitative method was more frequently used by many. A 10^3 CFU/ml or more were considered as an indicator for presence of concerned organism. The aim of present study is to compare pre-bronchoscopic sputum culture results with those of protected brush biopsy specimens obtained by fiberoptic bronchoscope in lower respiratory tract infections.

MATERIAL AND METHODS

The present study was conducted on 40 cases of lower respiratory tract infections. All the patients were admitted to chest and T.B. Hospital attached to Govt. Medical College, Patiala. The patients showing features of chronic bronchitis, bronchiectasis and pneumonias both clinically and radiographically were included in the study. Patients were selected irrespective of their age, sex, socio economic status, smoking and dietary habits. Small children, Pregnant mothers, acute asthmatics, patients of myocardial infarctions of six weeks and unstable angina, hemoptysis, hypoxemia, pleural effusion and those using oral antibiotics were excluded from the study.

The clinical information was recorded and clinical examination performed. Routine investigations were got done, written consent of the patients was obtained; premedication injection promethazine 50 mg was given half an hour before the procedure to alleviate the anxiety. Topical anesthesia was given in the form of 4% xylocaine. Examination of vocal cords was done for any paralysis, congestion or edema. The trachea and carina were examined for sub mucosal, mucosal edema, congestion and any intraluminal or extra luminal mass. Brushes were taken under direct vision from abnormal sites. Sputum was collected in a sterile glass tube for aerobic culture and portioned to a glass tube containing RCM media for anaerobic culture. The specimens were immediately transported to Microbiology Laboratory for culture of aerobic and anaerobic organisms. Morphology of the organisms was studied by gram staining. Every specimen was studied for AFB with ZN stain. Cases with sputum positive for AFB were not included in the study.

STATISTICAL ANALYSIS

The results were arranged in a tabulated form and expressed as percentage of total observations.

RESULTS

In our study total 40 patients were enrolled. Out of these 40 patients 36 patients (90%) were suffering from bronchiectasis, 3 patients (7.5%) were of pneumonia and 1 patient (2.5%) of chronic bronchitis. Table- 1 shows that in 39 cases, bronchoscopy was done by transnasal approach and in 1 patient it was done by transoral approach. Table 2 shows various aerobic organisms in protected brush specimen culture. Klebsiella pneumoniae and was revealed Escherichia coli were seen in 4 (10%) cases. Pseudomonas, proteus, streptococcus and normal flora were seen in 1(2.5%) cases. There were 25 cases which showed no growth. Table 3 shows various anaerobic organisms in sputum culture.

Peptostreptococcus was seen in 8 (20%) cases. Veillonella was seen in 4 case and diptheroids were seen in 2 case. Mixed growth was obtained in 1 cases and 25 cases showed no growth. Table 4 showing the Comparison of sputum culture and Protected brush specimens -Aerobic organisms.

DISCUSSION

The present study of forty patients of lower respiratory tract infection was carried out in Department of Chest and T.B, Government medical college, Patiala, with the aim to compare the results of direct sputum culture with that of protected brush specimen via flexible fiberoptic bronchoscope. In this study, Sputum positivity was observed in 45% in the present study whereas it was reported 46% by Brumffit⁵, 23% by Pecora and Yejian⁶ in 44% by Pecora⁷ and 50% was reported by Kulpati et al.⁸ In the present study, sputum culture revealed pneumonias in 10 (25%) of the cases, Escherichia coli in 3(7.5%), pseudomonas aeruginosa in 2 (5.0%), streptococcus hemolyticus in 2(5.0%), staphylococcus albus, staphylococcus in 1 (2.5%) each. Normal flora was revealed in 4(10%), mixed growth was found in 3(7.5%) of the cases. In a study by Chakrawarty⁹ in 1963, Sputum culture in 38 patients having lower respiratory tract infection revealed streptococcus viridans, normal flora in 27(79%), Neisseria group in 23 cases, Gram negative bacteria in 13 cases, S.Pneumoniae in two cases, Proteus and Escherichia coli were one each. In the above study by Chakarwarty et. al. also observed that majority of the patients revealed,

Type of LRTI	No of pts	%
Bronchiectasis	36	90%
Pneumonias	3	7.5%
Ch. bronchitis	1	2.5%
Total	40	100%

Table-1: Type of LRTI patients

Name of organism	No. of cases	Percentage
Pneumonia	4	10
Escherichia coli	4	10
Pseudomonas aeruginosa	1	2.5
Streptococcus haemolyticus	1	2.5
Staphylococcus aureus	3	7.5
Proteus	1	2.5
Normal flora	1	2.5
No growth	25	62.5
Total	40	100

Table-2: Showing various aerobic organisms in protected brush specimen culture

Name of organism	No. of cases	Percentage
Peptostreptococcus	8	20
Veillonella	4	10
Diptheroids	2	5
Mixed	1	2.5
No growth	25	62.5
Total	40	100

Table-3: Showing various anaerobic organisms in protected brush biopsy specimen culture

Aerobic organisms	Sputum culture		Protected brush specimen culture PBC		
	No of cases	% of case	Aerobic organisms	No of case	%
Pneumonia	10	25%	Streptococcus pneumoniae	4	20
Escherichia	3	7.5	Escherichia	4	10
Pseudomonas aeruginosa	2	5	Pseudomonas aeruginosa	1	2.5
Streptococcus haemolyticus	2	5	Streptococcus hemolyticus	1	2.5
Staphylococcus aureus	1	2.5	Staphylococcus aureus	3	7.5
Normal flora	4	10	Proteus	1	2.5
No growth	14	35	No growth	26	65
Mixed growth	4	10			
Total	40	100	Total	40	100

Table-4: Comparison of sputum culture and Protected brush specimens -Aerobic organisms

mixed organisms in cases of lung abscess. In the present study only three cases revealed mixed growth. One case revealed *Escherichia coli* and diphtheroids, one case revealed *pseudomonas aeruginosa* and *veillonella* where as third one revealed *veillonella* and *staphylococcus coagulase* negative. Incidence of 25% of pneumoniae in the our study is much lower as compared to the study by Dorf et. al.¹⁰ who observed 52.9% incidence of pneumoniae. Kulpati¹¹ also reported higher incidence of pneumoniae in his study. This could be due to immuno-compromised state of the patients. *Diplococcus* is the most common bacterium in their clinico-bacteriological study of pneumonia followed by *staphylococcus aureus*, and pneumoniae but none of the sputum culture showed *Diplococcus pneumoniae*. The cause of not obtaining pathogens in sputum could be due to small sample size and only single specimen was used in the present study as more number of specimens increase the yield of pathogens as reported by Kulpati and Kumar. Kumar⁸ reported organisms in 42.6% of the cases in sputum culture whereas Kulpati reported 50% yield of potential pathogens. Aerobic pathogens were present in 47.5% of cases.

In the present study protected brush specimens culture revealed *Klebsiella pneumoniae* in 10% cases, *staphylococcus aureus* in 7.5% cases and normal flora in 2.5% cases. Saha¹² found normal flora in 30 out of 32 cases in culture of bronchial aspirate in lower respiratory tract infections, *pseudomonas aeruginosa* in 4 (12.4%) cases, *staphylococcus aureus* and *streptococcus haemolyticus* in 6.2% cases each. In the present study *streptococcus viridans* was not cultured as frequently as in above study. Negativity in protected brush specimen culture could be due to the fact that specimen obtained was small in size. In 1980, Kulpati¹¹ found *pseudomonas* in 22.2% cases, *H. Influenzae* in 16.6% cases, *Klebsiella* in 11.1% cases. He reported a higher incidence of *pseudomonas*. In 1982, Wimberley et. al. performed bronchoscopy in 135 patients using protected brush in suspected lower respiratory tract infections. Four patients reported with mixed growth. Most common species were *streptococcus pneumoniae*, *H. influenzae* and pneumoniae.

In the present study same pathogens were revealed in 20% cases where as it was reported in 10 cases by Wimberley et al.¹³ Different pathogens were revealed in 12.5% cases. 25% cases revealed no growth. Negativity of brush culture system can be due to the beneficial effect of the local anaesthetic

as also observed by Rosenkranz.^{14,15} The main drawback associated with present study was that the sample size was small and so a study needs to be done with larger sample size to determine the exact correlation.

CONCLUSION

From the above study it can be concluded that sputum culture revealed pathogens in 45% of cases and brush biopsy revealed pathogens in 35% cases which is slightly better though statistically insignificant. Sputum revealed flora in 10% cases whereas brush revealed flora in 5% cases. Brush specimen revealed higher yield of anaerobic pathogens (35%) whereas sputum culture revealed only 12.5%. It can be concluded from the above study that fiberoptic bronchoscopic use with protected brush specimen reduces the incidence of contamination and gives better results for anaerobic infections of lower respiratory tract as compared to sputum culture.

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