Nigerian Journal of Paediatrics 1981; 8 (2): 61-64

Aetiological Diagnosis of Pneumonia in Childhood by Lung Puncture

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Summary

Diakparomre MA and Obi JO. Aetiological Diagnosis of Pneumonia in Childhood by Lung Puncture. *Nigerian Journal of Paediatrics* **1981; 8: 61.** Needle aspiration of the lung was undertaken in 73 children with pneumonia in order to establish the bacteriological diagnosis. Pathogens were isolated in 54.2% of the patients. The same organisms were isolated from the lungs and pharyngeal aspirates in 4.1% of the patients. Forty-two bacterial strains were isolated from 40 positive lung aspirates. *Staphylococcus aureus* and *Streptococcus pneumoniae* constituted 66.5% of the pathogens isolated. Mild complications, consisting of pneumothorax and haemoptysis, occurred in 5.5% of the patients. It is concluded that lung puncture in experienced hands, is a useful tool in establishing bacterial aetiology of childhood pneumonia.

Introduction

IN developing countries, bacterial infection of the lower respiratory tract is very common.[1-5] In Nigeria, bacterial pneumonia is one of the major causes of morbidity and mortality in children.[6] Pneumonia may be caused by a variety of pathogenic agents, but the clinical symptomatology and radiological appearances are generally similar and therefore give no clue as to the causative pathogen.[5 7] The classical acute lobar consolidation of pneumococcal infection, or the picture of staphylococcal pneumonic consolidation with pneumatocoeles are less frequent than the bronchopneumonic changes often seen on chest radiographs in children. The difficulty in obtaining sputum in infants and children, coupled with the doubtful results often obtained, limits the usefulness of this method of investigation. Often, methods of bacteriological investigation namely: blood culture, culture of pharyngeal secretion and tracheal washings, yield the causative organism in only a minority of cases. The need therefore to have specific aetiological diagnosis is self-evident if appropriate therapy is to be directed towards the offending pathogen.

The present study was undertaken in order to establish by lung puncture, the common bacterial pathogens causing pneumonia in children admitted to the University of Benin Teaching Hospital (UBTH), and also to compare the usefulness of the technique with other methods of bacteriological investigations.

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Patients and Methods

Patients with clinical and radiological evidence of pneumonia were studied. Patients with massive empyema and those with clinical and radiological evidence of tuberculosis were excluded. The area of maximum lung consolidation was determined from clinical examination and by the evaluation of chest radiographs. The skin of the chest-wall over the identified area was cleaned with hibitane and spirit. A gauge 18 bevelled needle attached to a 10cc syringe was used in the lung aspiration. As soon as the skin was pierced, vacuum was created by pulling on the plunger of the syringe. The needle was then advanced in a bayoneting motion towards the area of maximum consolidation. The plunger of the syringe was released just before the tip of the needle was withdrawn from the skin. In performing the lung aspiration, the anterior chest wall was avoided in order to reduce anxiety and to avoid the risk of piercing the heart.

The aspirate obtained usually varied from a mere drop to about 0.5ml. If enough aspirate was obtained, a drop was put on a clean slide for Gram-staining. The remaining aspirate was aseptically inoculated into peptone-supplemented nutrient broth for incubation and for routine bacteriological identification. Venous blood, and pharyngeal swab for culture were taken from the patient at the same time. The patient was then kept under close observation, and repeat chest radiograph was taken within 24 hours of the lung puncture.

Results

There were 73 patients (33 males, and 40 females), aged between 45 days and 12 years (mean age, 21 months). Twenty-seven patients (37%) had received antibiotics prior to admission, while 46 (63%) had not.

Pathogens were isolated from the aspirates in 40 patients (54.2%). Blood culture was positive in 2 patients (2.7%). Of the 46 children who had not received any antibiotics prior to admission, pathogens were isolated in 34 (73.9%), while in only 6 (22.2%) out of the 27 with prior antibiotic therapy did the aspirates yield positive cultures. Forty-two bacterial strains were isolated from the 40 positive aspirates (Table I). Thirty-seven had single pathogen isolated, while two pathogens namely: *Staph. aureus* and *E. Coli*, *Strep. pneumoniae* and *E. Coli*, *Pseudomonas* and *E. Coli* respectively, were isolated from each of the remaining 3 aspirates. Among the 40 patients with positive aspirates, 11 pathogenic bacteria were isolated from the pharyngeal swabs (Table II). In 3 patients (4.1%), the same pathogen was isolated from the pharynx as well as from the lung. The 2 patients with positive blood cultures had the same organism isolated from the lung aspirates.

Complications occurred in 4 patients (5.5%). Two of these had transient haemoptysis, while the other two had mild pneumothorax which reabsorbed spontaneously within 48 hours. Six of the 73 patients died within 48 hours of admission. These were mostly moribund on admission. No death appeared to be related to the lung puncture.

TABLE I

Organisms isolated from Lung aspirate in 40 Patients

Organism	*No. of Isolates*	*% of Total*
Staphylococcus aureus	22	52.3
Streptococcus pneumoniae	6	14.2
Escherichia coli	3	7.1
Staphylococcus albus	2	4.8
Psuedomonas aeruginosa	2	4.8
Haemophilus infuenzae	2	4.8
Proteus mirabilis	2	4.8
B-haemolytic streptococcus	2	4.8
Klebsiella aeruginosa	1	2.4
Total	42	100

TABLE II

Pathogens isolated from 11 Pharyngeal Swabs

Pathogen	*No. of times isolated*
Escherichia coli	7
Staphylococcus aureus	5
Proteus mirabilis	4
Klebsiella aeruginosa	4
Haemophilus influenzae	3
Streptococcus faecalis	1
Total	24

Discussion

Optimal antibiotic treatment of a patient with pneumonia requires a definite aetiological diagnosis. This is only possible by the isolation of the aetiologic pathogen. In the present study, the isolation rate was 54% which is higher than the 45·1% reported in Santiago.[5] The isolation rate of 73·9% in those without prior antibiotic therapy compares favourably with a rate of 79% reported from Zaria.[7]

Staphylococcus aureus was the commonest pathogen isolated from the lung aspirates. This agrees with the experience in Santiago,[5] but differs from the report from Zaria where *Streptococcus pneumoniae* was the commonest pathogen causing childhood pneumonia.[7] This difference probably derives from differences in the drug habits of the populace. In the Benin area as well as in Santiago, there is widespread use of self-prescribed antibiotics by patients.[5] The commonest antibiotics used in Benin are ampicillin and chloramphenicol. The widespread and indiscriminate use of antibiotics to which *Staphylococcus aureus* is resistant might have introduced selection factor resulting in the predominance of *Staphylococcus aureus*. Pathogenic bacteria are usually present in the pharyngeal secretion, tracheal aspirates, and cseretions from the main bronchi of normal individuals.[9] The present study therefore confirms the irrelevance of basing the aetiological diagnosis of pneumonia on the result of sputum or pharyngeal secretion culture. Blood culture is not a useful method of establishing the aetiological diagnosis of pneumonia since isolation rate by this method is very low.[5 7 10 11]

No death in childhood as a result of lung aspiration has been reported in 7 series of needle lung aspiration in non-immuno-compromised children.[4 5 7 12-15] Complications occurred in only 28 out of 880 patients. High rate of occurrence of pneumothorax (32%) as a complication of the procedure has only been reported in immunocompromised children.[16] Our complication rate of 5·4% is similar to the 5% reported from Zaria.[7]

It is suggested that needle aspiration using bevelled needle is, in experienced hands, a useful tool in establishing bacterial aetiology in childhood pneumonia.

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Accepted 25 November 1980