Do We Need Blood Cultures for The Management of Aspiration Pneumonia?

Aspirasyon Pnömonisinde Tedavinin Düzenlenmesinde Kan Kültürlerine İhtiyacımız Var Mı?

Gokhan Metan
Assist. Prof., M.D.
Department of Clinical Microbiology and Infectious Diseases
Erciyes University
gokhanmetan@gmail.com

İlkay Bozkurt
M.D.
Department of Clinical Microbiology and Infectious Diseases
Erciyes University

Orhan Yıldız
Assoc. Prof., M.D.
Department of Clinical Microbiology and Infectious Diseases
Erciyes University
oyildiz@erciyes.edu.tr

Emine Alp
Assoc. Prof., M.D.
Department of Clinical Microbiology and Infectious Diseases
Erciyes University
ealp@erciyes.edu.tr

Bilgehan Aygen
Prof., M.D.
Department of Clinical Microbiology and Infectious Diseases
Erciyes University
baygen@erciyes.edu.tr

Bülent Sümerkan
Prof., M.D.
Department of Microbiology and Clinical Microbiology
Erciyes University
bsumerkan@erciyes.edu.tr

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Corresponding Author:
Yard. Doç. Dr. Gokhan Metan
Erciyes Üniversitesi Tıp Fakültesi,
Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji Anabil Dalı
38039 Kayseri-Turkey

Phone : +90- 437 49 01 -22052
e-mail : gokhanmetan@gmail.com

Abstract
Purpose: The aim of this study was to evaluate the utility of blood cultures for the management of aspiration pneumonia.
Material and Methods: The patients who were hospitalized with a diagnosis of aspiration pneumonia were retrospectively identified from the records of Department of Infectious Diseases. The demographic and clinical features of the patients were extracted from the charts.
Results: Fifty patients with aspiration pneumonia between June 2005 and August 2008 were included into the study. Thirty-five patients had community acquired aspiration pneumonia while 15 had health-care associated aspiration pneumonia. Clinical cure was achieved at 49 patients while one patient died due to respiratory insufficiency. A total of 105 blood cultures were performed from 50 patients. Twenty-seven blood cultures were initially reported as positive, but only eight were true positive. The most common bacteria isolated from blood cultures were *Streptococcus pneumoniae*. Antibiotics were changed according to the blood culture result only in one patient with health-care associated aspiration pneumonia.
Conclusion: In this retrospective limited study we didn't observe any benefit of the blood cultures for the management of community acquired aspiration pneumonia. Prospective studies are needed to establish the utility of blood cultures in patients with health-care associated aspiration pneumonia.

Key words: **Pneumonia, Aspiration.**

Özet
Amaç: Bu çalışmanın amacı kan kültürlerinin aspirasyon pnömonisi tedavisinin düzenlenmesindeki önemini belirlenmesidir.
Gereç ve Yöntemler: Aspirasyon pnömonisi tanısı ile izlenen hastalar Enfeksiyon Hastalıkları Kliniği hasta kayıtları geçmişe yönelik olarak taranarak saptandı. Hastaların demografik ve klinik özellikleri dosyaları incelenerek belirlendi.
Bulgular: Haziran 2005 ile Ağustos 2008 tarihleri arasında aspirasyon pnömonisi tanısı ile izlenen 50 hasta çalışmaya dahil edildi. Hastaların 35'inde toplumda edinilmiş aspirasyon pnömonisi saptanırken, 15 hastada sağlık hizmeti kaynaklı aspirasyon pnömonisi mevcuttu. Bir hasta solunum yetmezliği nedeni ile kaybedilirken 49 hastada klinik kür elde edilmişti. Elli hastadan 105 kan kültürü alınmıştı. Bunların 27'sinde üreme saptanırken, sadece sekizi gerçek pozitifti. En sık izole edilen bakteri *Streptococcus pneumoniae* idi. Antibiyotik tedavisi kan kültürü sonucuna göre sadece sağlık hizmeti kaynaklı aspirasyon pnömonisi tanısı ile izlenen hastada değiştirilmişti.
Sonuç: Yaptığımız bu geriye yönelik sınırlı çalışmada kan kültürü alınmasının toplumda edinilmiş aspirasyon pnömonisinin tedavisinin düzenlenmesinde faydasını saptayamadık. Sağlık hizmeti kaynaklı aspirasyon pnömonisinde kan kültürün yerini belirleyebilmek için prospektif çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: **Pnömoni, Aspirasyon.**

Introduction

The number of elderly people and nursing home residents is increasing. Aspiration pneumonia which mainly occurs after the inhalation of oropharyngeal flora is an important complication in these patients (1, 2). *Streptoccoccus pneumoniae* is the most common bacteria in patients with community acquired pneumonia (CAP), but oropharyngeal colonization with gram-negative bacilli and *Staphylococcus aureus* with subsequent aspiration presumably accounts for the greater prevalence of these pathogens in patients with CAP following an aspiration event (2). In order to identify resistant pathogens and allow for appropriate antibiotic selection, several guidelines recommend performing blood cultures before initiating the treatment in hospitalized patients with CAP (3-5). Combining the results of seven studies that questioned the aid of the blood cultures in the management CAP, only 63 (2.2%) of 3228 patients had antibiotics changed on positive culture results. However, none of them specifically focused on the patients with aspiration pneumonia (6-12). The aim of this study was to evaluate the utility of blood cultures in the management of aspiration pneumonia at a country where resource for health-care expenses is limited.

Patients and Methods

This study was conducted at Erciyes University Gevher Nesibe Hospital, Kayseri, Turkey, a tertiary care hospital with 1300-beds. The patients who were hospitalized with a diagnosis of aspiration pneumonia were retrospectively identified from the records of Department of Infectious Diseases. Aspiration pneumonia was defined according to the following criteria:

(i) At least one of following symptoms: an episode of emesis, coughing during eating, presence of vomiting or tube feeding on a pillow or clotting combination with a new infiltrate on chest radiograph.

(ii) Two symptoms from the following: new purulent respiratory secretions, new tachypnea (respiratory rate 20≥breaths/min), new fever or hypothermia (axillary temperature ≥38°C or ≤36°C), or a change in mental status not explained by another cause within 24 hours (13, 14).

The exclusion criteria were any hospitalization in previous 10 days, co-existing of an other infection source and antibiotic administration before the obtainment of blood cultures. Only one episode from one patient was included in the study.

The following demographic information was extracted from the charts of the patients: age, gender, underlying diseases, results of sputum and blood cultures, initial antibiotic treatment, any changes in the antimicrobial treatment based on the culture results and clinical outcome. The severity of the illness was assessed by using pneumonia severity index scoring system derived by Fine and colleagues (15). Health-care associated pneumonia (HCAP) was defined in patients who met at least one of the following criteria: admission from a nursing home, rehabilitation centre, or an other long-term nursing care facility, previous hospitalization within the immediately preceding 12 months, receiving outpatient hemodialysis, or infusion therapy necessitating regular visits to a hospital based clinic and immunocompromised state (16).

During the study period, blood specimens were drawn at the bedside, and cultured in BACTEC 9240 blood culture system (Becton Dickinson, Cockeysville, MD, USA). Passage to blood agar was performed when the automated alert system signalled growth in any of the bottles and incubated at 5-10% CO_2. Blind passages were performed from the bottles with no growth signal on day seven. Identification and antimicrobial susceptibility tests were performed with MicroScan Walkaway system (Dade Behring, West Sacramento, CA, USA). Blood cultures positive for coagulase negative staphylocci without any proven risk factors were considered as contamination (17).

Results

There were 79 patients admitted to Infectious Disease Clinic with a diagnosis of aspiration pneumonia from June 2006 to August 2008. Blood cultures were performed in 70 patients. Twelve patients with nosocomial pneumonia, three patients with co-existing urinary tract infections, two patients with co-existing soft tissue infections and three patients with missing clinical data were excluded from the study. The remaining 50 patients with a median age of 66 years (range 18-96) were eligible for the analysis. Forty of the patients were male. The most common underlying disease was cerebrovascular disease. Thirty-five patients had community acquired aspiration pneumonia while 15 had HCAP. One patient died during the course of the treatment due to respiratory insufficiency. The clinical and demographic features of the patients are shown at Table 1.

Table 1. Characteristics and Pneumoniae Severity Index of Patients Included in the Study.

Characteristics	n
Median age (minimum-maximum)	66 (18-91)
Male / female	40 / 10
Underlying diseases	
Cerebrovascular disease	24
Alzheimer	7
Epilepsy	5
Demance	3
Diabetes mellitus	8
Coronary arterial disease	3
Chronic obstructive pulmonary disease	5
Solid tumour	1
Community acquired / Health-care acquired aspiration pneumonia	35 / 15
Pneumonia Severity Index	
II	13
III	9
IV	28

n, number of the patients.

A total of 105 blood cultures from 50 patients studied were performed. Twenty-seven blood cultures were initially reported as positive, but only eight were true positive. The microorganisms from positive cultures were: coagulase negative staphylocci (n=19), *Streptococcus pneumoniae* (n=2), *Klebsiella pneumoniae* (n=2), alpha-hemoliytic streptococci (n=2), *Candida albicans* (n=1) and methicillin susceptible *Staphylococcus aureus* (n=1). Blood and sputum cultures of the patients were shown at Table II. Twenty-nine patients received ampicillin/sulbactam as the initial therapy. The mean duration of antibiotic treatment was 10.9±4.3 days. Only one patient's treatment was changed according to the the blood culture results. This patient had HCAP and empirical antibiotic therapy with ampicillin/sulbactam was changed to ceftriaxone plus clindamycin due to ampicillin/sulbactam resistant *K. pneumoniae* bacteraemia. The sputum culture of the patient yielded the same isolate also (Table III).

Table II. Microorganisms Isolated from the Sputum and Blood Cultures of Patients.

Microorganism	Blood culture (n)	Sputum culture (n)
Streptococcus pneumoniae	2	3
Alpha-hemolytic streptococci	2	-
Staphylococcus aureus (methicillin susceptible)	1	-
Coagulase negative staphylococci	19	-
Klebsiella pneumoniae	2	1
Escherichia coli	-	1
Citrobacter spp	-	1
Pseudomonas aeruginosa	-	1
Acinetobacter baumannii	-	1
Stenotrophomonas maltophilia	-	1
Haemophilus influenza	-	3
Candida albicans	1	1

n, number of the patients

The thirteen of the sputum cultures were positive. *S. pneumoniae* was isolated in three patients, *Haemophilus influenza* in three patients and *K. pneumoniae* in two patients. *Pseudomonas aeruginosa*, *Acinetobacter baumannii* and *Stenotrophomonas maltophilia* were isolated in patients with HCAP. The patient whose sputum culture yielded *P. aeruginosa* was initially treated with ampicillin/sulbactam and changed to imipenem after culture results. Co-trimoxazole was added to the treatment regimen of the patient with *S. maltophilia* isolation. *A. baumannii* was susceptible to ampicillin/sulbactam which was started empirically.

Empirical antibiotic treatment was changed due to clinical failure in two patients receiving moxifloxacin and levofloxacin. The blood and sputum cultures of these patients were negative (Table III).

Table III. Antibacterial Treatment Regimens of the Patients.

Antibacterial regimen	Empirical (n)	Change due to blood culture results (n)	Change due to sputum culture results (n)	Change due to clinical failure (n)
Ampicillin/sulbactam	29	1	1	-
Moxifloxacin	6	-	-	1
Levofloxacin	5	-	-	1
Cefoperazone/sulbactam	4	-	-	-
Piperacillin/tazobactam	3	-	-	-
Ceftriaxone + Clindamycin	1	-	-	-
Ceftriaxone + Moxifloxacin	1	-	-	-
Cefepime + Clindamycin	1	-	-	-

n, number of the patients

One of the patients was admitted to emergency department with diabetic ketoacidosis. He had a severe candida mucositis and an infiltration on chest X-ray. He was initially treated with ceftriaxone and clindamycin with fluconazole. *C. albicans* was isolated from the blood and sputum cultures.

Discussion

The occurrence of aspiration pneumonia is increasing as a result of the increase in the number of elderly people. Anaerobic bacteria are key pathogens in the etiology of aspiration pneumonia, but they are difficult to culture from sputum or blood. Beta-lactam/beta-lactamase inhibitor combination antibiotics generally provide adequate anaerobic coverage for aspiration pneumonia (18). High rates of microbiologic and clinical cure were achieved by ampicillin/sulbactam in recent studies (14, 19). In this study, 36 of the patients received beta-lactam/beta-lactamase inhibitor combinations as empirical antimicrobial therapy and the rate of clinical success was 91.6%.

S. pneumoniae, *H. influenza*, *S. aureus* and *Enterobacteriaceae* are the other common pathogens that play a role in aspiration pneumonia which can be isolated from blood or sputum cultures (2). Blood cultures have a theoretical impact to detect the causative pathogens and allow the appropriate therapy, but nearly 90% of them are negative (20). In our study, true bacteraemia was detected in 14% of the patients and therapy was changed only in one patient based on the blood culture results whose blood culture yielded the same microorganism. Approximately 40%-50% of the patients with aspiration pneumonia had a positive sputum culture in different case series

(14, 18, 19). In a study which evaluated the treatment outcomes of CAP in patients older than 65 years, bacteriologic etiology was identified in 21 of the 67 patients by sputum cultures while only one patient had a positive blood culture (21).

Our study has several limitations. The contamination rate was 18.1% which may be the result of unproper obtainment of blood cultures. Although, there is a periodical training about the process, most of the blood cultures are drawn by the last year medical students at the emergency service under heavy workload. An other limitation is low number of the patients with HCAP who have higher risk for multi-drug resistant pathogens.

As a conclusion, determining the group of patients who are at the highest risk of having bacteraemia could decrease the number of the cultures drawn from the patients with a low likehood of having bacteraemia. In this manner, we can reduce the costs and also improve the process of obtaining cultures thereby decreasing the number of contaminants. In this limited study we didn't observe any benefit of the blood cultures in the management of community acquired aspiration pneumonia. Prospective studies including sufficient number of patients with health-care associated aspiration pneumonia could give important clues to establish the utility of blood cultures in this setting.

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