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ORIGINAL RESEARCH

Medicine Science International Medical Journal

Medicine Science 2018;7(4):837-40

Effect of aspiration risk on mortality in older age pneumonia cases

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Received 06 April 2018; Accepted 26 May 2018
Available online 19.09.2018 with doi:10.5455/medscience.2018.07.8878

Abstract

The incidence of community-acquired pneumonia (CAP) increases with age and is the leading cause of morbidity and mortality in older ages. Development of aspiration in these cases is one of the most important reasons to increase mortality. We retrospectively reviewed the data of sixty ninepatients over 65 years of age who were admitted with the diagnosis of community acquired pneumonia in order to determine the effects of aspiration risk factors on hospital stay and mortality. According to risk factors (neurological diseases, COPD, immobilization, cancer, etc.), cases were divided into two groups as high and low risk of aspiration. We aim to compared hospital stay and mortality in these groups. A total of sixty nine patients were included in this study. There were thirty patients in the group with high aspiration risk (group I) and thirty nine patients in the group with low aspiration risk (group II). CURB-65 scores were similar between the groups; however, pneumonia severity index was statistically higher in group II patients ($p = 0.002$). Mortality rates were significantly higher in group I (nine versus one) ($p = 0.001$). This was also valid for hospitalization times (11.7 ± 4.6 versus 8.4 ± 3.9 days, respectively) ($p = 0.004$). We found that the high risk of aspiration in advanced pneumonia cases was associated with prolonged hospital stay and increased mortality. At the same time there was a correlation between pneumonia severity index and hospital stay.

Keywords: Aspiration, mortality, older age, pneumonia

Introduction

Community-acquired pneumonia (CAP) is one of the most important causes of hospital admissions and treatment costs worldwide. The annual incidence in all age groups ranges from 9.2 to 33 in 1000 people [1-4]. The incidence of CAP increases with age and is the leading cause of morbidity and mortality in the elderly population [2,5]. In developed countries such as the United Kingdom and the United States, 6 th. most reason of all causes of death, and 1 st. most reason of deaths due to infections [3,8]. Development of aspiration in CAP cases is one of the most important factors that increase mortality. Aspiration is described as the passing through of oropharyngeal and / or gastric contents to the airways [9]. Sufficient bacterial burden in the lower respiratory tract is necessary for aspiration pneumonia to occur. This occurs as a result of aspiration of oral cavities or nasopharyngeal microorganisms after a disorder in the protective mechanisms of the lower respiratory tract [10]. The most important factor preventing aspiration is cough reflex and swallowing function. The fact that these factors do not observe normal function for any reason is the basis for aspiration. Many conditions, such as older age, male sex, neurological diseases (stroke, dementia, Parkinson'sdisease, multipl sclerosis), immobility,esophageal dysfunction, impaired conscious, dehydration, vomiting, dysphagia, reducedcoughreflex, poorswallow, oropharyngeal and dental plaque colonization by organisms, bad oral health, lung diseases, diabetes mellitus, angiotensin I-converting enzymes deletion, malnutrition, antipsychotic drugs, proton pump inhibitors, angiotensin-converting enzyme inhibitors, chronic cardio-pulmonary disease, and head and neck cancers pose aspiration risks [2]. Aspiration pneumonia is an important cause of morbidity and mortality, and it is the fourth most common cause of death in elderly patients. [8] We aimed to investigate the effects of aspiration risk factors on mortality and hospital stay in patients 65 years of age and older with CAP diagnosis.

Materials and Methods

We retrospectively reviewed the data of seventy seven patients over 65 years of age who were followed up and treated in our clinic between October 2016 and October 2017 with the diagnosis of pneumonia in the community. Patients were divided into two groups as patients group (group I) with high risk of aspiration according to risk factors and patient group (group II) with low risk of aspiration.The risk of aspiration of the patients was based on the presence or absence of comorbid diseases listed (Table 1). Group I patients were transferred from another clinic (4 patients), and 2 patients who were not able to receive file data were not included. In group II patients, 2 patients who were discharged from another

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hospital within the last 2 days were excluded from the study. Both groups were compared according to hospital stay and mortality.

Statistical Analysis

SPSS for Mac Version 20.00 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis of the data obtained at the end of the study. Continuous variables were expressed as mean ± standard deviation (SS), and categorical variables as number and percentage (%). The continuous variables were assessed by the Kolmogorov-Smirnov test for normal distribution. Mann-Whitney U test and Student-t test were used for chi-squared test for continuous variables and normal distribution for continuous variables in comparison of groups. Statistical significance was accepted as $p < 0.05$.

Results

A total of sixty nine patients who met the criteria were included to the study. There were a total of thirty ninepatients in the group with high aspiration risk (group I) and a total of thirty patients with low aspiration risk (group II). Patients in group I had the most frequent neurological disease followed by COPD and immobilization (Table 1).In all cases, the mean age was 78.41 ± 7.53 years, BMI was 23.57 ± 4.31 kg/m2, and mean hospital stay was 10.10 ± 4.59 day. The mean age of groupI and II was 78.2 ± 8.11 years versus 78.2 ± 7.11 years, the BMI was 22.2 ± 4.1 versus 24.9 ± 4.1 kg/m2, and the mean duration of hospitalization was 11.7 ± 4.6 versus 8.4 ± 3.9 days.There was no statistically significant difference between the groups in terms of demographic features such as age, gender and duration of smoking, excluding body mass index (Table 2). The CURB-65 scores, which constituted the main indications for admission, were similar between the groups (2.23 ± 0.43 versus 2.43 ± 0.67 for group I and II, respectively); however, pneumonia severity index (PSI) (122.8 ± 22.8 versus 105.3 ± 19.2 for group I and II) was statistically higher in group I patients ($p = 0.002$). However, there was no significant correlation between PSI and hospital stay. The number of drugs used by the patients was higher in group I patients (5.6 ± 2.5 versus 1.3 ± 1.6, respectively) and this was statistically significant ($p < 0.001$). Laboratory findings were not statistically significant when procalcitonin (PCT) levels were excluded (4.63 ± 4.23 ng / mL vs. 1.03 ± .99 ng / mL, respectively) (Table 3). At the same time, there was no significant correlation between PCT levels and PSI values in both patients and groupsWhen the mortality rates of our primary outcome were examined, mortality was significantly higher in group 1 (9 vs 1) ($p = 0.001$). This was also valid for hospitalization times (11.7 ± 4.6 versus 8.4 ± 3.9 days, respectively) ($p = 0.004$).

Table 1. The distribution of aspiration risk factors in group

Aspiration Risk Factors	GroupI n=30 (%)
Neurological Disease	18 (60)
Dementia (Alzheimer- Parkinson's-Senile)	11 (61.1)
CVD	5 (27.7)
HuntingtonKorea	2 (11.2)
COPD	5 (16.7)
Immobile	5 (16.7)
Cancer	3 (3.3)
DM	3 (3.3)
Achalasia	2 (6.7)

CVD: Cerebrovascular Disease, COPD: Chronic Obstructive Pulmonary Disease, DM: Diabetes Mellitus

Table 2. Comparison of characteristics of the study population

Characteristics	GroupI (n=30)	GroupII (n=39)	p
Gender, Male (%)	23 (%76.7)	31 (%79.4)	NS
Age (year)	78.5 ± 8.11	78.2 ± 7.11	NS
BMI (kg/m2)	22.2 ± 4.1	24.9 ± 4.1	0.005
Fever ©	36.9 ± .89	36.6 ± .57	NS
Pulse Rate (Pulse/mn)	93.5 ± 18.1	91.5 ± 16.6	NS
SBP (mmHg)	116.8 ± 17.3	121.0 ± 18.9	NS
DBP (mmHg)	66.2 ± 10.7	68.5 ± 11.6	NS
CigaretteUse (package/year)	14.5 ± 20	23.3 ± 27.2	NS
Number of Drugs	5.6 ± 2.5	1.3 ± 1.6	0.001
PSI	122.8 ± 22.8	105.3 ± 19.2	0.002
CURB-65	2.43 ± .67	2.23 ± .43	NS
Length of HospitalStay (day)	11.7 ± 4.6	8.4 ± 3.9	0.004
Exitus n (%)	9 (30)	1 (2.6)	0.001

SBP:Systolic Blood Pressure, DBP:Diastolic Blood Pressure, NS:NonSignificant, BMI: Body Mass Index, PSI:PneumoniaSeverity Index

Table 3. Comparisonof laboratoryfindings of the study population

LaboratoryFindings	GroupI (n=30)	GroupII (n=39)	p
Leukocyte103/µ)	13.74 ± 5.29	15.33 ± 7.45	NS
Hemoglobin (g/dL)	12.24 ± 1.99	11.25 ± 2.65	NS
Hematocrit (%)	37.51 ± 5.66	34.97 ± 8.32	NS
Platelets (103/µL)	240.01 ± 80.76	224.12 ± 84.43	NS
Neutrophil (103/µL)	12.81 ± 5.94	13.48 ± 6.94	NS
Lymphocyte (103/µL)	1.16 ± .98	1.11 ± 1.02	NS
NLR	16.24 ± 13.42	19.27 ± 15.18	NS
Glucose (mg/dL)	145.8 ± 51	167.1 ± 85.5	NS
Urea (mg/dL)	71.4 ± 47.2	77.5 ± 36.9	NS
Creatinin (mg/dL)	1.14 ± .54	1.58 ± .73	NS
Albumin (g/dL)	2.70 ± .55	2.93 ± .58	NS
LDH (U/L)	325.1 ± 144.5	299.2 ± 107.4	NS
Sodyum (mmol/L)	136.7 ± 7.25	136.8 ± 5.56	NS
ESR (mm/h)	76.53 ± 30.1	78.10 ± 28.0	NS
hs-CRP (mg/L)	131.53 ± 71.8	152.48 ± 71.2	NS
Procalsitonin (ng/mL)	1.03 ± .99	4.63 ± 4.23	< 0.001
pH	7.426 ± .056	7.418 ± .068	NS
PaO2 (mmHg)	59.3 ± 11.3	61.5 ± 13.6	NS
PaCO2 (mmHg)	35.9 ± 13.9	34.6 ± 9.6	NS
SaO2 (%)	88.5 ± 6.5	88.6 ± 7.3	NS

NLR: Neutrophil lymphocyte ratio, ESR: Erytrocyte Sedimentation Rate
hs-CRP:HighSensitive C-Reactive Protein, LDH: Lactatedehydrogenase

Discussion

In this study, we compared mortality and hospital stay according to risk of aspiration in 65 years and older patients with CAP. The most important data obtained from our study are increased mortality and hospital stay durations in the group with high risk of aspiration. Changes in consciousness as risk factors for aspiration pneumonia were selected as comorbid diseases in which swallowing function and cough reflex suppressed comorbid diseases, mainly dysphagia resulting from various neurological diseases and diseases holding upper gastrointestinal system, as a result of changes in consciousness level.These risk factors are also the most important risk factors in various studies [10-13]. Immobilization, also identified as a risk factor, and COPD are accepted as risk factors, and malignancy and diabetes are also included in risk factors [6]. Although age was also identified as an important risk factor for aspiration risk [14], our study was not identified as a risk factor in our study because all of our patients were selected over the age of 65 years. The fact that age is not statistically significant among the groups indicates this situation.Compared to the two groups, there is no difference in clinical findings including fever, pulse and blood pressure. Smoking was not found statistically significant among the groups. Similarly, Hibberd et al. also investigated smoking as a risk factor, but did not find it significant [6].Again, in the same study it was stated that weight loss was not a risk factor but in general, malnutrition was defined as a risk factor for aspiration pneumonia [15]. In our study, BMI was found to be significantly lower in the group with high risk of aspiration. When we look at the laboratory findings, the only difference was observed in PCT levels and PCT levels were significantly higher in the patient group with low risk of aspiration. Studies in this area have shown that serum PCT levels are not a good predictor of bacterial aspiration pneumonia in studies conducted by Ali A. El-Solh et al. [16]. In a recent study, the diagnostic value of PCT was compared between aspiration pneumonia and pneumonitis, but no difference was found [16]. In our study, mortality rates were found to be higher in the group with low PCT levels when the relation of PCT levels to mortality was examined. This can be explained by the fact that patients with high risk of aspiration usually have chronic and neurological disorders, most of these patients are bed dependent, the use of unconscious antibiotics is higher in these patients, and the hospital admission is later.In the studies of Kim et al. [17] involving 155 cases of CAP, 99 of the cases were over 65 years of age and in these cases, PCT levels did not have a relation with mortality. In the same study, it was found that there was a positive correlation between PCT levels and PSI values. In our study, there was no significant correlation between PCT levels and PSI values in both patients and groups.Another study looked at the diagnostic benefit of serum PCT levels in pulmonary aspiration syndromes, with increased PCT levels associated with hospital mortality [16]. Studies have shown that radiological involvement during aspiration pneumonia is mostly in the lower lobes and in

the posterior segments. The main purpose of our study, mortality and hospitalization, was higher in the patient group with high risk of aspiration, and this difference was statistically significant. When we look at the studies done in the literature, it is seen that our results are compatible with the literature.Komiya K et al. in multicenter retrospective cohort studies involving 417 TGP and 220 healthcare-associated pneumonia cases, the presence of aspiration pneumonia was the most important independent risk factor for predicting 30-day mortality [18]. As a result of the same study, the authors stated that the presence of aspiration pneumonia may be an important predictor of mortality among these patient groups. In another study of a total of 628 aspiration pneumonia cases, of which 510 were TGP, mean age 77 and 30-day mortality was 21%. When the results of the same study were compared with TGP, it was concluded that the incidence of aspiration pneumonia in the community was older and the hospital admission, hospitalization frequency and intensive care need were higher in this patient group [19]. The retrospective nature of our study, the small number of cases and the inability to evaluate all of the factors described in the literature as aspiration risk factors in all cases constituted limited aspects of our study.

Conclusion

In conclusion, the presence of risk factors such as COPD and immobilization, especially in neurological diseases in the elderly (≥65) pneumonia cases in the community, increases the hospitalization duration and mortality significantly in these patients.At the same time, the costs of treatment are also increasing in relation to the increased hospitalization time of these patients. Assessing the risk of aspiration in this patient group is an important parameter in predicting mortality. However, these data should also be supported by larger case series and prospective studies.

Competing interests
The authors declare that they have no competing interest

Financial Disclosure
The financial support for this study was provided by the investigators themselves.

Ethical approval
Before the study, permissions were obtained from local ethical committee.

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