

Determination of Demographic Changes of Acute Pulmonary Embolism Patients Applied to Emergency Service: Retrospective Analysis of 60 Cases

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Abstract

Background: The aim of this study was to determine the clinical and demographical traits of the increasing number of patients diagnosed with pulmonary embolism and hence to contribute to the literature in order to analyze the possible changes occurred in time.

Materials and Methods: Our study is a retrospective study conducted with all patients over the age of 18 who applied to the emergency service and diagnosed with pulmonary embolism between 01.01.2017 and 01.01.2019. Demographic and clinical data of patients such as patients' complaints, background story, physical examination and laboratory inspections were determined by analyzing physical files formed at the application and saved data in the information system, and relationship between all the data was analyzed by determination of calculated wells criteria scores.

Results: A total of 60 patients were included in the study. The average age of the patients was 64.46 (16.95). Among the patients, 34 (56.7%) were female while 26 (43.3%) were male. Shortness of breath and chest-back pain were the leading complaints of emergency service applications by 36 (60%) and 16 (26%), respectively. The leading background stories of the cases were malignancy with 14 (23%) patients, and hypertension with 12 (20%) patients. The most common physical examination indication was bruit with 21 (35%) patients and pretibial edema with 11 (18%) patients, while 12 (20%) patients did not show any symptom. Thrombolytic treatment was applied to 4 patients in the emergency service.

Conclusion: We believe that studies investigating demographic traits of life-critical and easy to skip diseases like pulmonary embolism which causes to apply to the emergency service will contribute to diagnosis.

Keywords: Emergency service, acute pulmonary embolism, demographic changes

Introduction

Pulmonary embolism is a disease setting of a venous thromboembolism (VTE) with a deep vein thrombosis. It is usually hard to diagnose the disease and suspecting is necessary first to diagnose. It is 3rd leading cardiovascular cause of death¹. Investigations in United States of America revealed 1-2 pulmonary embolism incidence in thousand people and it is accepted as a preventable disease². The most common symptoms of the disease are sudden start of shortness of breath, stinging chest pain, tremor, cyanosis, hemoptysis and sometimes pain with swollen legs³.

The increase of specialist employment in emergency services and development of technical facilities in emergency services might have increased the number of investigations about acute pulmonary embolism in patients with non-specific clinical picture. In fact, recent studies indicate the increase in cases with pulmonary embolism diagnosis

due to the enhanced access to diagnostic tools⁴. Although this situation leads to increase usage of some imaging techniques, the major concern is what contribution is made in return to the risks caused by the radiation and contrast matter load to the patients. As a result of these facilities, how much diagnosing low risk or non-life-threatening pulmonary embolism patients would contribute to patient survey is still among the topics which are unclarified and should be investigated.

Besides the developing emergency service standards and the number of qualified doctors, increase in the population would naturally contribute to the number of patients diagnosed with acute pulmonary embolism. Moreover, environmental standards and life standards of the present patient population are not compatible with the life standards of the previously diagnosed acute pulmonary embolism patients whose demographic data have been used in the current studies

Together with the sources and directions formed by many professional institutions supporting the careful use of imaging resources, suggestions for the choice of CT angiogram usage for patients with pulmonary embolism suspicion are now accessible^{4,5}. However, the researches taken into account during the formation of such suggestions should be conducted in the light of data obtained from recent samplings, and for this, the introduction of demographical studies which are usually reified but of high fundamental importance is required.

Our aim to conduct this study was to contribute to the literature for the analysis of potential changes happening over time by determining the clinical and demographic traits of the increasing number of patients diagnosed with pulmonary embolism.

Materials and Methods

Our study is a retrospective study conducted with all patients over the age of 18 who applied to the emergency service and diagnosed with pulmonary embolism between 01.01.2017 and 01.01.2019. Physical files of the cases formed at the application and saved data in the information system were analyzed. Patients with missing background information were eliminated even if they were diagnosed with acute pulmonary embolism.

Demographic and clinical data of patients such as patients' complaints, background story, physical examination and laboratory inspections were determined and relationship between all the data was analyzed. Calculated wells criteria scores of the patients were evaluated. Moreover, the presence of hypoxia-hypocarbica and its coupling with S1Q3T3 wave pattern in electrocardiogram was investigated. In order to gather the standard patient data, a case report form was prepared. All laboratory results were selected from the first results obtained at the time of patients' application to emergency service. Physical exam results were recorded individually for each patient. Prior to the study, approval with the date and number of 08.10.2021-86030 was obtained from Namık Kemal University Faculty of Medicine Ethical

Statistical analysis

All data were stored in IBM SPSS Statistics 18 software. Kolmogorov-Smirnov test was used to evaluate the normality distributions of the parameters. Pearson Chi-square test was used to relationship between categorical variables. Mann-Whitney U test was conducted to find out the relationship between numerical variables. Continuous variables were expressed as mean \pm standard deviation. Numerical expressions of categorical values were expressed as absolute number and percentage. $p < 0.05$ was accepted as statistically significant.

Results

A total of 137572 files were scanned for this study. 171 patients whose ICD code was acute pulmonary embolism were selected for further detailed investigation. The sampling size was determined to be 60 after eliminating patients with missing background information and incorrect ICD codes and a total of 60 patients were included in the study. The average age of the patients was 64.46 (16.95). Among the patients, 34 (56.7%) were female while 26 (43.3%) were male.

Shortness of breath and chest-back pain were the leading complaints of emergency service applications by 36 (60%) and 16 (26%), respectively. They were followed by 6 (10%) fever and 5 (8.3%) hemoptysis (Table 1).

Table 1: Complaints of the cases applying to the emergency department

Dyspnea	36(%60)
Chest-back pain	15(%25)
Fever	6(%10)
Hemoptysis	5(%8,3)
Syncope	4(%6,6)
Lower extremity pain	4(%6,6)
Weakness	3(%5)
Tachycardia	3(%5)

The leading background stories of the cases were malignancy with 14 (23%) patients, and hypertension with 12 (20%) patients. They were followed by coronary arterial disease and heart failure, and asthma and COPD, respectively. There was no disease history in 6 patients. Detailed data about patients' background stories are given in Table 2.

Table 2: History of the cases

	n(%)
malignancy	14(%23,3)
Hypertension	12(%20)
CAD+CHF	11(%18,3)
Asthma+COPD	8(%13,3)
DM	2(5%)
immobilization	2(5%)
No features	6(%10)

CAD: coronary artery disease, CHF: chronic heart failure COPD: chronic obstructive pulmonary disease, DM: diabetes mellitus

The most common physical examination indication was bruit with 21 (35%) patients and pretibial edema with 11 (18%) patients, while 12 (20%) patients did not show any symptom. Symptoms of physical examinations are given in detail in Table 3.

Table 3: Physical examination findings in the cases

	n(%)
Ral	27 (%45)
Ronkus	13 (%21,66)
PTE	16 (%26,66)
Homans	5(%8,33)
No features	15(%25)
Inspection failed	3(%5)

PTE: pretibial edema

When the average laboratory data of the cases were analyzed, the data were determined as follows: D-dimer 8.24 ± 8.75 mg/L (0-0.55), troponin 22.03 ± 30.5 ng/L (0-14), creatinine 1.00 ± 0.35 mg/L (0.5-0.9), and urea 42.95 ± 24.18 mg/L (19-44). Moreover, in 20 (33.3%) of the cases there was hypoxia-hypocarbica coupling, in 5 (8.3%) patients S1Q3T3 wave pattern was detected in electrocardiogram (Table 4). The cases were categorized in terms of VTE risk according to the Wells scoring system. While 1 (1.7%) patient fell into low-risk group, 53 (88.3%) patients were in medium risk group, and 6 (10%) patients were in the high-risk group.

Table 4: Laboratory data of the cases

	Mean \pm std n(%)	Cut-off range
D-dimer mg/L	$8,24 \pm 8,75$	0 - 0,55
CRP mg/L	$98,01 \pm 146,36$	0 - 5
Troponin ng/L	$22,03 \pm 30,5$	0 - 14
Urea mg/L	$42,95 \pm 24,18$	19 - 44
Creatin mg/L	$1,00 \pm 0,35$	0,5 - 0,9
WBC $10^3/uL$	$10,69 \pm 3,98$	4 - 10,5
Hg g/dL	$12,01 \pm 2,1$	12,5 - 16
Platelet $10^3/uL$	$241,95 \pm 104,84$	132 - 356
pH log [H+]-	$7,44 \pm 0,07$	7,35 - 7,45
pO2 mmHg	$71,35 \pm 111,55$	80 - 100
pCO2 mmHg	$34,91 \pm 9,07$	35 - 45
Pt sn	$14,73 \pm 5,99$	10 - 15
Aptt sn	$24,73 \pm 3,77$	21 - 32
INR INR	$1,18 \pm 0,15$	0,8 - 1,3
ECG- S1Q3T3	5(%8,3)	
Hypoxia-hypocarbica coexistence	20(%33,3)	PaO2<80mmHg PaCO2<40mmHg

CRP: C reactive protein, WBC: wight blood cell, Hg: hemoglobin, Pt: prothrombin, Aptt: activated partial prothrombin time, INR: international normalized time, ECG: electrocardiography, std: standard deviation.

A total of 45 patients included in the study were hospitalized in the service for further tests and treatment, while 15 were interned in the intensive care unit. Also, thrombolytic was applied to 4 patients in the emergency service. While 5 patients died while followed in the intensive care unit, 55 patients were discharged with full recovery.

Discussion

The incidence of PE increases with age. The PE incidence was determined to be 1 in 100,000 among young individuals, while this ratio was indicated to increase hundred times above the age 80². In a study conducted by Duru et al. (2012), 86 (42%) over 205 patients diagnosed with PE were over age 65, and the average age of all cases was determined to be 61.55 ± 4.44 ⁶. The results of our study were close to those of literature. Among our patients, 27 (45%) were below 65. We consider that risk factors that increase by age increase the pulmonary embolism incidence, and also changing environmental conditions and habits can lower the age of prevalence of PE.

The situation is similar for the sex. DE Lilienfeld stated that PE was more common among males than females in all races as a result of his analysis of data in USA between 1979-1996⁷. This ratio was detected to increase in the favor of women in the study of Mutlu LC, 2005⁸. The number of female patients were higher than that of males. We speculate that there may be different causes of this situation, such as the increase of in-vitro fertilization applications in women and the enhancement of embolic events caused by the medications used in this treatment, or raise of smoking among women which is a serious risk factor for PE, or increase in the deskwork rates due to the increased partaking of women in business life and its setting ground for embolic events.

Surgical intervention, DVT and heart disease were the most frequent among the background stories in many studies^{2,3,6-8}. Chronical heart failure (19%), chronical respiration failure (16.5%), and malignity (5%) were stated to be the most frequently encountered additional diseases in the study by Duru et al.⁶. Surgical intervention, DVT story and heart disease were still present among the background stories of the patients, but malignity was the leading with 14 (23%) patients. We speculate that the increase in prevalence of malignities and increase in the survey of cancer patients are among the most important reasons of this situation. Moreover, oncology follow-up patients are high since our hospital is a tertiary care health service, and the preference of our clinic in case of emergency by these patients can be among the reasons of this situation.

The clinics of patients diagnosed with PE changes depending on the localization of thrombus and demographic and background story. PIOPED (Prospective Investigation of Pulmonary Embolism Diagnosis) study stated that rate of incidence of shortness of breath, pleuritic chest pain and cough complaints were 85%, 64% and 53%, respectively, in cases

diagnosed with massive PE cases; while the same complaints were 82%, 85% and 52%, respectively, in cases with sub-massive PE⁹. The most common symptoms in our study were dyspnea and back-chest pain, as compatible with the literature. Symptoms and clinical findings were generally stated to be of high sensitivity but not of sufficient specificity in the evaluation of patients with PE¹. We attribute the non-reflection of limited changes of the demographic data of the cases included in this study to the clinical findings to the mentioned situation.

Another important area of use of the demographic and clinical data is the evaluation of diagnosis probability of the cases. In the manual about pulmonary embolism published by European Respiratory Society (ESC) (2019), it was indicated that the symptoms and clinical findings should be evaluated together with the risk factors for VTE, and by this means, different clinical or pre-test probability classifications corresponding to increasing real prevalence of PE cases with final diagnosis could be done in the patients suspected for PE⁴. Wells and Geneva scoring systems are the common risk scoring systems in this application, which are also suggested in the current manuals¹⁰⁻¹². Hence, we think that presence of malignancy having a score equivalent in these scoring systems confirms the hypothesis of our study stating the importance of evaluation of demographic data.

Limitations

1. Our findings and results may be regional owing to the monocenter study.
2. The data of some patients could not be accessed and included since the study was a retrospective one.

Conclusion

The number of cases diagnosed with pulmonary embolism has been increased recently due to the enhanced accessibility of diagnostic tools. However, there are a few studies evaluating the interaction of this increase with factors other than the developing diagnostic methods. We believe that demographic studies carried out in different periods will contribute to determine the potential changes. Of course, in order to make a clearer comment on this issue, there is a need for many studies examining the demographic characteristics of different societies.

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