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Yılmaz ZENGİN[1]
Ercan GÜNDÜZ[1]
Recep DURSUN[1]
Mustafa İÇER[1]
Hasan Mansur DURGUN[1]
Mahşuk TAYLAN[2]
Cahfer GÜLOĞLU[1]

RESEARCH

AFFECTING FACTORS ON EARLY MORTALITY IN ELDERLY PATIENTS DIAGNOSED WITH PULMONARY EMBOLISM IN EMERGENCY DEPARTMENT

ABSTRACT

Introduction: The ratio of elderly people in Turkey is rapidly growing. It is known that pulmonary embolism and venous thrombolysis incidence increases with age. Despite the major advances in pulmonary embolism diagnosis and treatment, pulmonary embolism leads to higher mortality rates in the elderly. In the present study, evaluation of socio-demographic and clinical characteristics of elderly patients diagnosed with pulmonary embolism in the emergency department and determination of factors that affect early mortality have been targeted in order to decrease mortality.

Materials and Method: Between January 1, 2009, and September 30, 2014, patients who were 65 years of age and older who had been admitted through the emergency department with suspected pulmonary embolism and whose pulmonary embolism diagnosis was finalized via a computerized tomographic pulmonary angiography.

Results: In the study, 87 (61.8%) were female and 52 (38.2%) were male. Thirteen patients (9.4%) died during the follow-up period. The analysis of the relationship between pulmonary embolism in elderly patients and early mortality revealed that there is a statistical correlation among immobility, syncope, tachycardia, hypotension, elevated Troponin-T, coronary arterial disease, cerebrovascular disease, pulmonary embolism with massive dimension, bilateral pulmonary embolism, Wells-likely pulmonary embolism, and modified Geneva-likely pulmonary embolism were statistically related factors(p values, respectively, were 0.002; 0.033; 0.000; 0.000; 0.000; 0.037; 0.011; 0.000; 0.030; 0.023; 0.018).

Conclusion: Immobility, syncope, tachycardia, hypotension, elevated Troponin T, coronary arterial disease, cerebrovascular disease, pulmonary embolism with massive dimension, bilateral pulmonary embolism, Wells-likely pulmonary embolism, and modified Geneva-likely pulmonary embolism were determined as effective risk factors affecting the early mortality of elderly patients with pulmonary embolism.

Key Words: Aged; Mortality; Pulmonary Embolism.

ARAŞTIRMA

ACİL SERVİSTE PULMONER EMBOLİ TANISI KONULAN YAŞLI HASTALARDA ERKEN MORTALİTEYİ ETKİLEYEN FAKTÖRLER

ÖZ

Giriş: Tüm dünyada olduğu gibi Türkiye'de de yaşlı nüfus oranı hızla artmaktadır. Pulmoner emboli ve venöz tromboli insidansının yaşla birlikte arttığı bilinmektedir. Pulmoner emboli tanı ve tedavisindeki büyük ilerlemelere rağmen pulmoner emboli yaşlılarda daha yüksek oranda mortalite ile sonuçlanmaktadır. Bu çalışmada, acil serviste pulmoner emboli tanısı alan yaşlı hastaların sosyodemografik ve klinik özelliklerini değerlendirmek ve mortalitenin azaltılabilmesi için erken mortalite üzerindeki etkili faktörlerin belirlenmesi amaçlanmıştır.

Gereç ve Yöntem: Bu çalışma 01.01.2009 tarihi ile 30.09.2014 tarihleri arasında acil servise başvuran 65 yaş ve üzeri olan ve pulmoner emboli şüphesi ile çekilen kompüterize tomografik pulmoner anjiografilerinde pulmoner emboli tanısı kesinleşen 139 hasta hastane bilgisayar kayıt sisteminden retrospektif olarak incelendi.

Bulgular: Bu çalışmada hastaların 87'si (%61,8) kadın, 52'si (%38,2)'si erkekti. Hastaların takibinde 13 kişi (9,4%) yaşamını kaybetti. Çalışmada pulmoner embolili yaşlı hastalarının acil başvuru anındaki özellikleri ile erken mortalite arasındaki faktörlerin araştırıldığı analizde immobilite, bayılma, taşikardi, hipotansiyon, Troponin T yükselmesi, koroner arter hastalığı, serebrovasküler hastalık, masif boyutlu pulmoner emboli olması, bilateral pulmoner emboli olması, Wells skorlamasında muhtemel pulmoner emboli olması ve Modifiye Genava skorlamasında muhtemel pulmoner emboli olmasının istatistiksel olarak ilişkili faktörler olduğu tespit edildi(p değerleri sırasıyla 0,002; 0,033; 0,000; 0,000; 0,006; 0,037; 0,011; 0,000; 0,030; 0,023; 0,018).

Sonuç: İmmobilite, senkop, taşikardi, hipotansiyon, Troponin T yükselmesi, koroner arter hastalığı, serebrovasküler hastalık, masif boyutlu pulmoner emboli olması, bilateral pulmoner emboli olması, Wells skorlamasında muhtemel pulmoner emboli olması ve Modifiye Genava skorlamasında muhtemel pulmoner emboli olması yaşlı pulmoner embolili hastalarda erken mortalite üzerine etkili faktörler olarak bulunmuştur.

Anahtar Sözcükler: Yaşlı; Mortalite; Pulmoner Emboli.

Correspondance

Yılmaz ZENGİN
Dicle University, Faculty of Medicine, Department of Emergency Medicine, DİYARBAKIR

Phone: 0412 248 80 30
e-mail: yilmazzengin79@gmail.com

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[1] Dicle University, Faculty of Medicine, Department of Emergency Medicine, DİYARBAKIR
[2] Dicle University, Faculty of Medicine, Department of Chest Diseases, DİYARBAKIR

Introduction

The elderly population rate is increasing rapidly in Turkey (1). It is observed that there has been a progressive increase in the number of elderly visiting Turkish emergency departments during the last ten years (2). Elderly patients make up 12–21% of all emergency admissions and 30–50% of elderly visitors to the emergency department who are subsequently admitted are hospitalized primarily in intensive care units (3).

It is known that pulmonary embolism (PE) and venous thrombolysis incidence increases with age (4). PE symptoms and findings may hide and lead to delays in diagnosis and treatment due to other accompanying cardiac and pulmonary diseases (5). Wells scores and Modified Geneva scores are among the most frequently used PE clinic probability rules for early diagnosis of patients with PE risk and suspicion (6). Despite the major advances in PE diagnosis and treatment, PE leads to higher mortality rates in the elderly (7). In the present study, evaluation of socio-demographic and clinical characteristics of elderly patients diagnosed with PE in the emergency department and determination of factors that affect early mortality have been targeted in order to decrease mortality.

Materials and Method

In the present study, after receiving ethical committee approval (2014/51), 139 patients 65 years of age and older who had been admitted through the emergency department with suspected PE from January 1, 2009, and September 30, 2014 and whose PE diagnosis was finalized via computerized tomographic pulmonary angiography (CTPA), were investigated retrospectively by using records available in the hospital computer recording system. The type of the study was a retrospective cross-sectional study. Patients who were dead on arrival, cases under 65 years of age, and patients whose information was unavailable were excluded from the study.

Socio-demographic and clinical characteristics such as age, gender, season during which the patient was admitted, presenting symptoms, accompanying diseases, arterial blood pressure, pulse, oxygen saturation, predisposing illnesses, laboratory values, and patient outcome were evaluated. The patients were divided into two groups based on their hospital outcomes as living and dead and factors that affect mortality were investigated. Early mortality in PE was accepted as death at the hospital or at home within 30 days after diagnosed PE.

Pulmonary embolism diagnosis was made through the determination of images consistent with CTPA pulmonary thromboembolism taken with computerized tomography equipment containing 64 detectors (Brilliance BT equipment, Philips Medical Systems, Cleveland, Ohio). Pulmonary embolism dimension was divided into three groups as massive (embolism in main pulmonary arteries), segmental, and subsegmental; in addition, it was divided into three groups according to PE settlement location as right, left, and bilateral.

Wells scores and Modified Geneva scores, which are the pulmonary embolism clinical probability rules, were estimated as two-level scoring and three-level scoring. D-dimer cut off value was accepted as > 279 ng/ml according to the HemosiL method and as 0.5 µg/ml as per the Tinaquant method; results exceeding these values were considered D-dimer positivity. Troponin was measured as T quantitative data by Bechman Coulter Access 2 equipment and the reference interval was 0–0.04 µg/l. A µg/l value ≥0.1 for troponin T was accepted as troponin T positivity.

Statistical analysis was performed using SPSS 18.0 (Statistical Package for Social Science, Chicago, IL, USA). Data were tested for normality using the Kolmogorov–Smirnov normality test. The results were expressed as means ± SD or number of patients. Categorical data were analyzed using the chi-square test. Multivariate logistic regression analysis (Backward-Wald Step-Wise Model) was used to detect risk factors for mortality. Odds ratios (OR) with 95% confidence intervals (CI) were estimated. A Student's *t*-test was used for normally distributed data. A p value of < 0.05 was considered significant.

Results

In the present study, out of 139 patients whose PE diagnoses were finalized by CTPA taken in the emergency department with PE suspicion, 87 (61.8%) were female and 52 (38.2%) were male. The clinical and socio-demographic characteristics of the patients are presented in Table 1, Table 2, Table 3, and Table 4. Thirteen patients (9.4%) died during the follow-up period.

In the study, in Table 5, factors between the characteristics of PE patients at the moment of emergency department application and mortality were investigated; it was determined that immobility, syncope, tachycardia, hypotension, elevated Troponin T, coronary artery disease (CAD), cerebrovascular disease (CVD), PE with massive dimension, bilateral

Table 1— Socio-demographic Characteristics of Elderly Patients with Pulmonary Embolism, and Predisposing Factors.

Socio-demographic Characteristics	Survival (n=126)	Nonsurvival (n=13)	Total (n=139)
Age (years, mean±sd)	72.7±6.4	71.5±5.8	72.5±6.4
Gender, n (%)			
Female	80(63.5)	7(53.8)	87(62.6)
Male	46(36.5)	6(46.2)	52(37.4)
Admission season, n (%)			
Winter	25(19.8)	5(38.5)	30(21.6)
Spring	46(36.5)	1(7.7)	47(33.8)
Summer	29(23.0)	5(38.5)	34(24.5)
Autumn	26(20.0)	2(15.4)	28(21.0)
Predisposing factors, n (%)			
Immobilization	22(17.5)	7(53.8)	29(20.9)
Previous history of PE or DVT	9(7.1)	1(7.7)	10(7.2)
Operation	27(21.4)	1(7.7)	28(20.1)
Varices ofleg	1(0.8)	1(7.7)	2(1.4)
Maligmancy	8(6.3)	–	8(5.8)
Prolonged travel	4(3.2)	–	4(2.7)
Thrombophilia	2(1.6)	–	2(1.4)
Hormone replacement therapy	1(0.8)	–	1(0.7)
Fracture of lower extremity	27(21.4)	2(15.4)	29(20.9)

PE: Pulmonary embolism, DVT: Deep venous thrombosis.

Table 2— Clinical Findings.

Exammation Parameter, n(%)	Survival (n=126)	Nonsurvival (n=13)	Total (n=139)
Presenting symptoms			
Shortness of breath	119(94.4)	13(100.0)	132(95.0)
Chest pain	90(71.4)	7(53.8)	97(69.8)
Syncope	5(4.0)	3(23.1)	8(5.8)
Palpitation	34(26.9)	13(100.0)	7(5)
Hemoptysis	29(23.0)	4(30.8)	33(23.7)
Weakness	11(8.7)	2(15.4)	13(9.4)
Limb pain	48(38.1)	6(46.2)	54(38.8)
Accompanying diseases			
Hypertension	46(36.5)	7(53.8)	53(38.1)
Diabetes Mellitus	26(20.7)	1/(7.7)	27(19.4)
Malignancy	8(6.3)	–	8(5.8)
CAD	41(32.5)	8(61.5)	49(35.3)
COPD	23(18.3)	3(23.1)	26(18.7)
Deep vein thrombosis	53(42.0)	1(7.7)	54(38.8)
CVD	6(4.8)	3(23.1)	9(6.5)
CRF	3(2.4)	–	2(2.2)
Others	50(39.7)	3(23.1)	53(38.1)
Haemodynamic parameters			
Systolic blood pressure <100 mmHg	7.0(5.6)	5(38.5)	12(8.6)
Tachypnea (>20/min)	90.0(71.4)	7(53.8)	97(69.8)
Tachyeardia (>100/min)	34.0(27.0)	13(100.0)	47(33.8)
Arterial oxygen saturation <90%	82.0(65.1)	13(100.0)	95(68.3)
Elevated D-dimer	119.0(94.4)	13(100.0)	132(95.0)
Elevated Troponin T	14.0(11.1)	13(100.0)	27(19.4)
Need for intensive care	25.0(19.8)	8(61.5)	33(23.7)

CAD: Coronary artery disease, COPD: Chronic obstructive pulmonary disease, CVD: Cerebrovascular disease, CRF: Chronic renalfailure.

Table 3— Degree and Localization of Pulmonary Embolism.

	Survival (n=126)	Nonsurvival (n=13)	Total (n=139)
Localization level of PE, n(%)			
Massive	23(18.3)	9(69.2)	32(23.0)
Segmental	82(65.1)	6(46.2)	88(63.3)
Sub segmental	55(43.7)	2(15.4)	17(13.7)
Localization side of PE, n(%)			
Right	38(30.1)	11(84.6)	45(32.3)
Left	40(31.7)	11(84.6)	37(26.7)
Bilateral	48(38.0)	9(69.2)	57(41.0)

PE: Pulmonary embolism.

Table 4— Multivariate Logistic Regression Results for Risk Factors Affecting Early Mortality in the Elderly Pulmonary Embolism.

Clinical Probability Rules	Survival (n=126)	Nonsurvival (n=13)	Total (n=139)
Wells Score (Mean±sd)	4.9±2.1	6.1±2.0	5.0±2.0
Three-level score, n(%)			
Low (<2 point)	9(7.1)	–	9(6.5)
Intermediate (2-6 point)	84(66.7)	7(53.8)	91(65.5)
High (>6 point)	33(26.7)	6(46.2)	39(28.0)
Two-level score, n(%)			
PE unlikely (<4 point)	50(39.7)	1(7.7)	51(36.7)
PE likely (>4 point)	76(60.3)	12(92.3)	88(63.8)
Modified Genava Score (Mean±SD)	8.6±4.4	12.7±4.2	9.0± 4.5
Three-level score, n(%)			
Low (0-3 point)	14(11.1)	–	14(10.1)
Intermediate (4-10 point)	71(56.3)	6(46.2)	77(55.4)
High (>11 point)	41(32.5)	7(53.8)	48(34.5)
Two-level score, n(%)			
PE unlikely (0-5 point)	39(31.0)	–	39(28.1)
PE likely (>6 point)	87(69.0)	13(100.0)	100(71.9)

Table 5— Multivariate Logistic Regression Results for Risk Factors Affecting Early Mortality in the Elderly Pulmonary Embolism.

Risk Factors	Ods Ratio	95% Confidence Intervals	p
Immobilization	0.23	0.08-0.62	0.002
Syncope	0.29	0.09-0.89	0.033
Tachycardia	0.09	0.01-1.71	<0.001
Hypotension	0.15	0.06-0.39	<0.001
Elevated Troponin T	0.25	0.09-0.69	0.006
CAD	0.34	0.12-0.98	0.037
CVD	0.23	0.08-0.69	0.011
PE with massive dimension	0.13	0.04-0.40	<0.001
Bilateral PE	0.31	0.10-0.96	0.030
Wells Likely PE	0.14	0.02-1.07	0.023
Modifiye Genava Likely PE	0.06	0.00-0.28	0.018

CAD: Coronary artery disease, CVD: Cerebrovascular disease, PE: Pulmonary embolism.

PE, Wells-likely PE, and modified Geneva-likely PE were statistically related factors (p values, respectively, were 0.002; 0.033; 0.000; 0.000; 0.000; 0.037; 0.011; 0.000; 0.030; 0.023; 0.018).

Discussion

Although pulmonary embolism is a major health problem, few effective studies are performed on mortality risk factors and prognosis in elderly patients with PE (8). PE mortality rates range between 10–30% (9,10). However, there was no significant difference in our study in the clinical and socio-demographic characteristics of the patients between the previous studies, immobility, syncope, tachycardia, hypotension, elevated Troponin T, CAD, CVD, PE with massive dimension, bilateral PE, Wells-likely PE, and modified Geneva-likely PE were determined as effective risk factors influencing early mortality for geriatric patients with pulmonary embolism.

In the Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED) study, immobility was determined to be one of the most frequently encountered risk factors for PE in all age groups (11). In another study, Masotti et al. (12) reported that among elderly patients diagnosed with acute PE, 65% had immobility. In our study, immobility was found to be one of the most frequent risk factors for PE and also a factor that affects mortality. We think that mortality due to PE can be decreased in immobile elderly patients by taking prophylactic precautions for PE and, when PE is suspected, by starting investigations and treatment rapidly.

In a study conducted by Punukollu et al. (13), it was indicated that the most frequent application complaint in elderly PE patients was syncope. Furthermore, syncope may be an indication of hemodynamic reserve in PE patients. In severe cases, shock and arterial hypotension are major indicators of mortality (6,14). One of the most frequent physical examination findings in PE patients is tachycardia (>100 beats/min) (15). On the other hand, a previous study reported that syncope, hypotension, and tachycardia may be seen in other cardiovascular comorbidities and that differential diagnoses for PE may be difficult in some elderly patients (16). Therefore, clinical practitioners should be attentive when diagnosing PE in elderly patients. However, in a previous study, patients' hemodynamic situation was determined to be the strongest indicator related to early-phase mortality in PE (14). In our study, parallel to this information, syncope as a presenting symptom-along with hypotension and tachycardia findings upon physical examination-was found to be the most significantly effective mortality factor in PE patients. Therefore, we think that mortality due to these factors can be decreased in PE patients through rapid hemodynamic support.

In PE, an increase in cardiac troponin levels is observed in 20–40% of the patients (17). High levels of cardiac troponin are directly proportional to the seriousness of the clinical state. In these patients, death rates while in the hospital increased 30-fold; therefore, there is need for more aggressive treatment in these patients (18). Cardiac troponin level increases in middle-and wide-diameter pulmonary embolism patients, and it is negative in almost all of the small-diameter pulmonary embolism patients. Mortality in PE patients depends on not only the cardiopulmonary reserve but also upon the embolism dimension (19). In our study, elevated Troponin T, PE with massive dimension, and bilateral PE were among the most effective mortality factors in PE patients. We think that Troponin T elevation occurs as a result of accompanying hypotension, right ventricular infarction, or hypoxemia associated with embolism size, and we consider main comorbid diseases to be a more direct sign of the size of PE than the level of embolism. Appropriate treatment should be started immediately to decrease mortality.

However in the previous studies, there was no relation between the presence of a comorbid disease and mortality due to PE (20,21). In the study by Bulbul et al. (22), mortality rate was found to be 9.6%, and it was observed that mortality was high, specifically in the patient group with additional illnesses. Also, Duru et al. (1) reported that the most common reason for both early and late mortality was the occurrence of comorbid diseases. In our study, CAD and CVD in patients with PE were found to be factors that also affected mortality. This situation can be explained by the higher risk of disturbing hemodynamic situations in elderly patients with CAD and more severe hemodynamic impairment. The presence of CVD can be explained by increased PE tendency, depending on immobility. In case of accompanying comorbid illnesses in PE patients, mortality can be decreased by closer hemodynamic observation and treatment.

Wells and modified Geneva scores are among the PE clinical probability rules (CPR) that are most frequently used in the early diagnosis of patients with risk or suspicion of PE, and it is thought that they are not superior to one another (6,23). A change is not observed in the performances of these scoring methods with increased age (24). A large section of PE patients is included in the likely PE group in both scoring methods (6). In a prospective study that checked the achieve-

ment of these two CPRs, authors reported that selection of CPR should be dependent on institutional predilection and practice, as the results of this study were parallel for all CPRs (25). Although a large percentage of the patients were included in the likely PE group in both scoring methods in our study, inclusion of PE patients in these groups was also found to be due to factors that affect mortality. This situation can be explained by the patients in these groups having other factors that could also affect mortality. We consider that the application of any CPR seems to be far more significant than the selection of which specific CPR to practice, that CPR must be used carefully, and that close monitoring is necessary for the patients included in the PE-likely group.

One of the limiting factors in our retrospective study was the scanning data of some patients in the hospital computer system was inadequate, although the patients came to the emergency medical clinic and were treated. The other limiting factor was leaving patients who were suspected of PE but who died prior to diagnosis with CTPA and who had insufficient data out of the study.

In conclusion, immobility, syncope, tachycardia, hypotension, elevated Troponin T, CAD, CVD, PE with massive dimension, bilateral PE, Wells-likely PE, and modified Geneva-likely PE were determined as effective risk factors affecting the early mortality of elderly patients with PE. In light of the results of this study, we conclude that PE and mortality for PE can be decreased among elderly people-particularly those who are at risk for PE and have risk factors affecting mortality-by providing them with close hemodynamic monitoring and treatment.

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