



Original article

Prognostic value of prior heart failure in patients admitted with acute pulmonary thromboembolism[☆]



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ABSTRACT

Background and objective: Pulmonary thromboembolism (PTE) is a very common condition with high mortality. Although some scales include heart failure (HF) as a risk factor of PTE, none of them have assessed the contribution of the different kinds of HF, i.e. with reduced or preserved left ventricular ejection fraction (LVEF) to the in-hospital outcome of patients admitted with PTE.

Patients and method: A retrospective study assessing a cohort of patients consecutively admitted to hospital with a PTE from 2012 to 2014. Baseline epidemiological characteristics, treatment during admission and prognostic variables during hospitalization were analyzed. Primary endpoint was defined as hospital mortality for any cause.

Results: A total of 442 patients with PTE were included (88 with prior HF). Patients with a history of HF were older, more frequently had hypertension, diabetes mellitus, chronic kidney or pulmonary disease, cancer, and coronary artery disease, and showed less LVEF ($p < .001$). Hospital mortality was significantly higher in patients with prior HF (21.6 vs. 6.8%, $p < .001$). Multivariate analysis found that HF with reduced LVEF but not HF with preserved LVEF resulted as an independent risk factor (respectively OR 5.54; 95% CI 2.12–14.51 and OR 129; 95% CI 0.72–4.44).

Conclusions: Patients with prior HF admitted to hospital with PTE should be considered a high-risk population, since they present high in-hospital mortality. In our cohort, patients with prior HF and reduced LVEF presented a poorer prognosis than those with preserved LVEF.

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Valor pronóstico del antecedente de insuficiencia cardiaca en pacientes ingresados con tromboembolia pulmonar

RESUMEN

Palabras clave:

Tromboembolismo pulmonar

Insuficiencia cardiaca

Fracción de eyección del ventrículo izquierdo

Pronóstico

Fundamento y objetivo: El tromboembolismo pulmonar (TEP) es una entidad frecuente con una elevada morbimortalidad. Aunque algunas escalas consideran la insuficiencia cardiaca (IC) como factor de riesgo de TEP, ninguna ha analizado la contribución del tipo de IC, con fracción de eyección del ventrículo izquierdo (FEVI) reducida y preservada, al pronóstico intrahospitalario de los pacientes ingresados con un episodio de TEP.

Pacientes y método: Estudio de cohortes retrospectivo que incluyó pacientes hospitalizados por TEP de manera consecutiva durante el período comprendido entre 2012-2014. Se analizaron las características epidemiológicas basales, el tratamiento durante su ingreso, así como variables pronósticas durante su estancia hospitalaria. Se definió como objetivo primario la mortalidad intrahospitalaria por cualquier causa.

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Resultados: Se incluyeron 442 pacientes con TEP (88 con historia de IC). Los pacientes con antecedente de IC resultaron ser mayores, con mayor porcentaje de hipertensos y diabéticos, mayor presencia de enfermedad renal crónica, pulmonar u oncológica y cardiopatía isquémica, y con menor FEVI ($p < 0,001$). La mortalidad intrahospitalaria fue significativamente mayor en el grupo con historia previa de IC (21,6 frente a 6,8%, $p < 0,001$). En el análisis multivariante, únicamente la IC con FEVI reducida se mostró como factor de riesgo independiente (OR 5,54; IC 95% 2,12–14,51), no así la IC con FEVI preservada (OR 1,29; IC 95% 0,72–4,44).

Conclusiones: Los pacientes con antecedentes de IC ingresados con un TEP deben ser considerados como una población de alto riesgo, presentando una elevada morbimortalidad intrahospitalaria. Dentro de este grupo, son aquellos con IC y FEVI reducida los que presentan un peor pronóstico.

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Introduction

Pulmonary thromboembolism (PTE) is a major cause of morbidity and mortality and hospitalization in our healthcare environment.^{1,2} It is considered that PET is the result of the interaction between risk factors related to the patient, usually permanent (e.g., history of oncologic disease), and others related to the environment, usually temporary (trauma or recent surgery requiring prolonged immobilization, pregnancy, etc.).^{3–6} Therefore, a correct assessment and identification of these factors is essential in all patients with suspected PTE, to allow early diagnosis and start treatment as soon as possible.

During the stratification and treatment of patients with PTE, the assessment of clinical and biological variables that provide prognostic information helps guide treatment decisions.^{7,8} So, deciding whether patients should be admitted to the intensive care unit to apply thrombolytic therapy or determining the adequacy of an early discharge can be predicted from the emergency department.^{9–11}

Within the prognostic stratification, the *Pulmonary Embolism Severity Index* and its simplified version have been validated for identifying low-risk patients.^{12–16} Prior history of cancer or chronic obstructive pulmonary disease, age > 80 years, admission parameters indicating hemodynamic instability or a history of heart failure (HF) are among the clinical variables to consider.

Although HF is associated with a hypercoagulable state and patients hospitalized due to an episode of decompensated HF have an increased risk of venous thromboembolism, its weight on the scales of stratification is proportionally lower compared to the rest of variables.^{17–20} Moreover, none of the scales refers to the prognostic difference between patients with HF according to whether they have a reduced or preserved ejection fraction (LVEF), a fact that is relevant in other cardiovascular diseases with high prevalence and morbidity, such as acute coronary syndrome.^{21,22}

This paper evaluates the relevance of prior HF history in patients hospitalized for an episode of PTE, as well as differences in the hospital prognosis between HF with reduced or preserved LVEF.

Methods

Study population

442 patients consecutively admitted to the Internal Medicine Department of the Prince of Asturias University Hospital, Alcala de Henares, Madrid, with the diagnosis of PTE in the period 2012–2014 were included. The diagnosis of PTE and HF was based on criteria consistent with clinical practice guidelines.^{1,23} Heart failure with reduced LVEF was considered if they had values <50%, with the rest being considered HF with preserved LVEF. Patients were included in a retrospective cohort study. Baseline epidemiological characteristics, clinical parameters at admission, laboratory data, prior treatment and hospital treatment were rigorously reviewed.

Hospital death from any cause was defined as main outcome variable, incidence of bleeding complications, *shock*, stroke, heart failure decompensation during hospitalization, atrial fibrillation (AF) or development of pulmonary hypertension were considered as secondary variables. Patient follow-up lasted until hospital discharge.

Statistical analysis

The normal distribution of variables was verified through the Kolmogorov–Smirnov test. Quantitative variables were expressed as mean \pm standard deviation if they fulfilled the condition of normality, or by the median and interquartile range if they did not meet that condition. Categorical variables were expressed as frequencies and percentages. The association between categorical variables was verified by chi-square test or Fisher's exact test when at least 25% of the values showed an expected frequency lower than 5. The Student's *t*-test was used to compare quantitative with dichotomous variables. Differences found with a probability of error lower than or equal to 5% ($p \leq 0.05$) were considered as significant. Multivariate analysis was performed using the logistic regression test by taking the value of $p \leq 0.05$ as the threshold to include the covariate in the model. Given the results of the univariate analysis and medical literature, the following variables were considered in the models: age, hypertension, diabetes mellitus, chronic renal disease, chronic obstructive pulmonary disease, previous AF, ischemic heart disease, cancer and HF. SPSS[®] version 15.0 was used for data analysis (SPSS Inc., Chicago, IL, USA).

Results

The baseline characteristics of the patients are listed in [Table 1](#). Of the 442 included, 88 had history of HF. These patients were found to be older (79.9 vs. 65.5 years of age, $p < 0.001$) and associated more comorbidities: hypertension (75.0 vs. 44.9%, $p < 0.001$), diabetes mellitus (31.8 vs 15.8%, $p < 0.001$), chronic renal disease (25.0 vs 5.9%, $p < 0.001$), chronic obstructive pulmonary disease (20.5 vs. 8.8%, $p = 0.002$), ischemic heart disease (30.7 vs. 5.6%, $p < 0.001$), AF (29.5 vs. 3.9%, $p < 0.001$) and lower LVEF (56.3 vs. 62.2%, $p < 0.001$). Although hypoxemia was more frequent in patients with a history of HF (63.6 vs. 38.4%, $p < 0.001$), no differences in hemodynamic parameters were observed. As for laboratory parameters, patients with a history of HF had higher levels of brain natriuretic peptide and creatinine, with no statistical differences in antithrombotic treatment used during admission.

[Table 2](#) shows the percentage of adverse events during hospitalization in patients with PTE. The incidence of the primary endpoint, all-cause hospital mortality was statistically higher in the group with a history of HF (21.6 vs. 6.8%, $p < 0.001$). In addition, this cohort of patients with previous HF presented higher frequency of nosocomial infection (50.0 vs. 26.8%, $p < 0.001$), major bleeding (18.1 vs. 7.3%, $p = 0.002$), HF decompensation during hospitalization (40.9 vs.

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