ORIGINAL ARTICLE

Prognostic Value of Neutrophil to Lymphocyte Ratio in Patients with Acute Pulmonary Embolism: A Restrospective Study

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Background   Acute pulmonary embolism (PE) is a serious clinical condition characterised by a high mortality rate. Previous studies showed that leukocytosis was associated with recurrences of venous thromboemboli, major bleeding and increased mortality. The aim of the present study was to investigate the prognostic value of neutrophil to lymphocyte ratio (NLR) in patients with acute PE during short term follow-up.

Method   A total of 640 patients were screened by I26 code of ICD-9 and 359 patients were included as cases of confirmed acute PE. Admission blood counts and clinical data were obtained from medical charts. The predictors of 30-day mortality were examined.

Results   Fifty-one out of 359 patients (14.2%) included in the study died during 30 days follow-up. In multivariate Cox regression analysis systolic blood pressure (HR:0.97 (0.94–0.99 CI95%), $p = 0.019$), diabetes mellitus (HR:3.3 (1.30–8.39 CI95%), $p = 0.012$), CK-MB(HR:1.03 (1.01–1.06 CI95%), $p = 0.024$) and NLR (HR:1.03 (1.01–1.06 CI95%), $p = 0.008$) were predictors of 30-day mortality. An optimal cut-off value of NLR was determined as 9.2 by using ROC curve. Hazards ratio of NLR > 9.2 was found to be 3.60 (1.44–9.18 CI95%, $p = 0.006$). NLR > 9.2 had a sensitivity, specificity, negative predictive value, and positive predictive value of 68.6%, 80.5%, 93.9% and 36.5%, respectively.

Conclusion   NLR on hospital admission may be a predictor of 30-day mortality in acute PE. Since complete blood count is a part of the routine laboratory investigation in the most hospitalised patients use and preliminary promising results of this study, NLR should be investigated in future prospective randomised trials regarding prognostic value in acute PE.

Keywords   Pulmonary embolism • Lymphocytes • White blood cells

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Introduction

Acute pulmonary embolism (PE) is an important cardiovascular disease with a mortality rate of 15–20% [1]. Hence prognostic markers are of clinical significance. Currently haemodynamic instability and right ventricular (RV) dysfunction are commonly used prognostic indicators. In addition to these, some laboratory parameters are under investigation including troponin, H-Fab BNP and white blood cell count (WBC) [1]. Afzal et al. [2] first described independent elevation of WBC count in acute PE. This increase was accounted for haemorrhage/infarction syndrome and comorbid conditions [2]. WBC count has been shown to be related to recurrence, major haemorrhage and mortality in cancer patients with acute venous thromboembolism [3]. It has been demonstrated that increased WBC count may have a prognostic value rather than be a diagnostic tool [4,5]. WBC >11.000/mm^3 or <4000 mm^3 was proposed as having a likely prognostic significance [5].

In recent years, ratio of peripheral neutrophils to lymphocytes (NLR) was proposed as a better indicator of inflammation compared with WBC count [6]. The balance between neutrophils and lymphocytes has been regarded as a marker of systemic inflammation [6]. Increased NLR has been shown to be related to in-hospital mortality and coronary plaque disruption in acute coronary syndromes (ACS) and stable coronary artery disease, respectively [7–9]. In spite of accumulating data with respect to value of NLR in different clinical settings, the prognostic significance of NLR in acute PE is yet to be determined. The aim of this retrospective study was to investigate the prognostic value of NLR in patients with acute PE during 30 days follow-up.

Materials and Methods

Study Population

This is a retrospective study that included adult patients admitted to a university hospital with diagnosis of acute PE between January 2007 and March 2012. A total of 640 patients were screened and 440 patients were determined as having a confirmed PE by pulmonary computed tomography (CT) ($n = 300$), ventilation/perfusion scintigraphy ($n = 122$), or invasive pulmonary angiography ($n = 18$). The study was approved by the Local Ethical Committee.

Exclusion Criteria

Patients with haematological disorders (WBC $<3.0 \times 10^9$/L or $>20.0 \times 10^9$/L), infectious and inflammatory diseases, serious renal and liver disease as well as current use of immunosuppressant drugs (including steroids) were excluded from the study. After excluding 81 patients with PE, 359 patients were eligible for the study (Fig. 1).

Study Protocol

Acute PE cases were screened by ICD-9 code of I26 from the electronic database of the hospital. After initial screening process, diagnostic method of PE was determined such as CT, scintigraphy or echocardiography and patients were classified into definitive acute PE or suspicious acute PE.
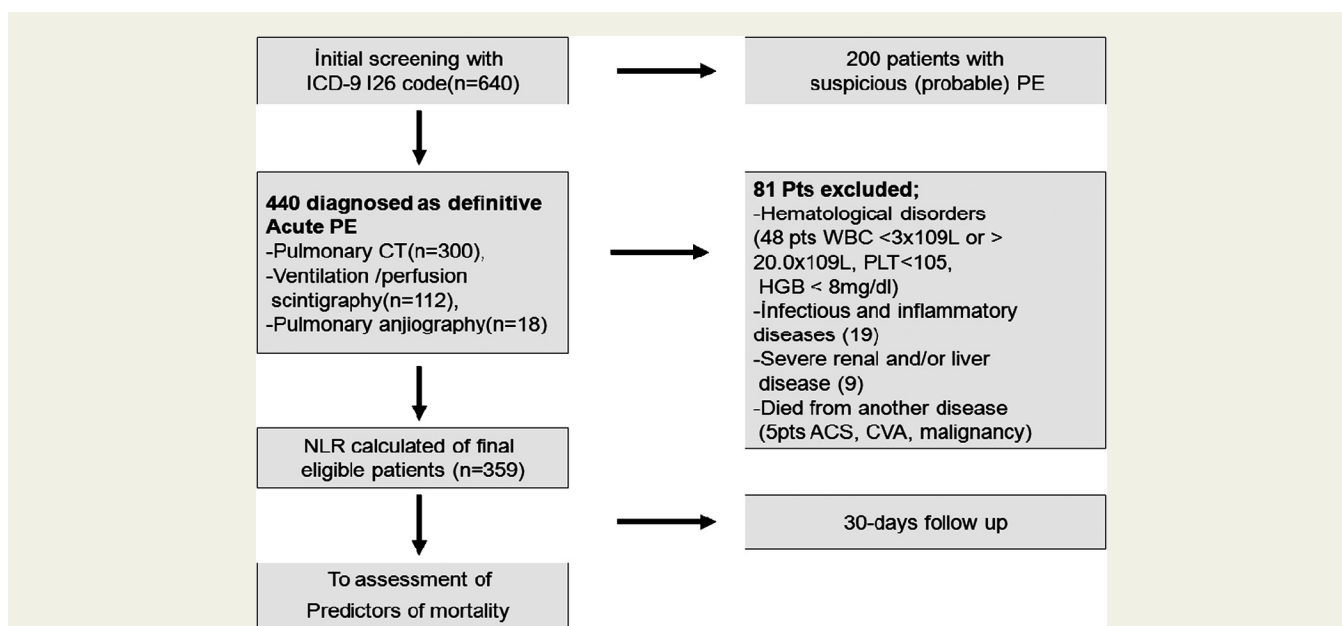

Figure 1 Flow chart of the study design. PE: pulmonary embolism; CTA: computerised tomography angiography; WBC: white blood cell count; PLT: platelet count; HGB: haemoglobin; ACS: acute coronary syndrome; CVA: cerebrovascular accident.