

Clinical presentation of pulmonary thromboembolism in an emergency department: comparison with previous studies

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RECEIVED:

25-8-2009

ACCEPTED:

27-11-2009

CONFLICT OF INTEREST:

None.
Presented as a poster at the "XIX Congreso Nacional de la Sociedad Española de Urgencias y Emergencias (SEMES, the Spanish Society of Accident and Emergency Medicine)" held in Tarragona, 06 June 2007.

Objective: To analyze the clinical, electrocardiographic, radiologic, and analytic characteristics of patients diagnosed with pulmonary thromboembolism and to compare them with previously published data.

Methods: Retrospective review of the hospital records of patients admitted with a presumptive diagnosis of pulmonary thromboembolism between January 1, 2004 and December 31, 2006. The data were analyzed using SPSS software, version 14.0.

Results: The diagnosis was confirmed in 83 patients. The patients mean (SD) age was 70.8 (15) years and 18.1% had a prior history of pulmonary thromboembolism or deep vein thrombosis. Active neoplastic disease was present in 15.7% of cases, a history of immobilization in 45.8%, chest pain in 31.3%, and syncope in 16.9%. No patient had hemoptysis. Signs of deep vein thrombosis were noted in 28.9%, venous insufficiency in the lower limbs in 20.5%, tachypnea in 89.8%, tachycardia in 54.4%, S₁Q₃T₃ in 23.1%, right bundle-branch block in 16.7%, negative precordial T waves in 15.4%, raised hemidiaphragm in 22.8%, basal atelectasis in 4.8%, pleural effusion in 16.9%, PaO₂ ≤ 60 mmHg in 30.9%, and PaCO₂ ≤ 35 mmHg in 48.1%. Computed tomography angiography showed involvement of the central pulmonary vessels in 51.8% and bilateral and multiple involvement in 45.8%. Overall, 30-day mortality was 7.2%.

Conclusions: Our patients presented characteristics that were different from those of other published series. They were older, had a higher rate of syncope, absence of hemoptysis, a low rate of massive pulmonary thromboembolism, and low mortality at 30 days. These data suggest the need for prospective multicenter studies that would allow us to validate new pretest scales of diagnostic probability for the Spanish population. [Emergencias 2010;22:113-116]

Key words: Pulmonary thromboembolism. Emergency health services. Elderly patient.

Introduction

Pulmonary thromboembolism (PTE) continues to be one of the major diagnostic problems in emergency departments (ED). In the United States (U.S.) the incidence is one case per 1000 people per year¹, and increases with age to one case per 100 people per year by the age of 85 years. In Europe, the incidence of venous thromboembolism (VTE) has been reported as 160 cases per 100,000 population per year^{2,3}, which, for our population of 44 million, means more than 70,000 cases per year in Spain, of whom 26,400 will have PTE. A study by the Spanish Society of Accident and Emergency Medicine (SEMES)⁴ performed in

EDs found 30 cases of VTE per 100,000 inhabitants per year, representing one emergency case per 818 cases treated; 35% of these patients with VTE treated in the ED had pulmonary embolism.

The rate of 30-day mortality associated with PTE is 12%⁵. In U.S.A., PTE is estimated to be the cause of death of 5% of the population, representing approximately 60,000 deaths per year⁶. However, this figure could be higher as a result of under-diagnosis. Some studies report less than 50% of diagnosed cases after confirmed post-mortem PTE⁷.

In recent years, aging of the population in industrialized countries has become a public health problem. Immobility and associated comorbidity

would suggest an increase in the prevalence of VTE in this population.

The clinical symptoms of PTE are not very specific. The same occurs with basic laboratory investigations^{8,9}. Certain patient data classically considered as suggestive of PTE, drawn from Anglo-Saxon series^{10,11} appear to be infrequent in our setting.

In the ED of our Hospital del Mar, records of PTE diagnosis have been kept since 2004. The aim of this study was to determine the clinical symptoms, and major electrocardiographic, radiological and laboratory data, of patients diagnosed with PTE as from introduction of computerized tomography (CT) lung angiography as a diagnostic tool.

Method

The study was conducted in the ED of the Hospital Universitario del Mar de Barcelona, a tertiary care hospital with 431 beds, serving a population of 350,000. We retrospectively reviewed hospital discharge reports of patients referred from the ED with a presumptive diagnosis of PTE. We included cases hospitalized between 1 January 2004 and 31 December 2006. In this period 280,770 emergencies were treated. We analyzed clinical, radiological, ECG and laboratory data of this population.

The diagnosis of PTE was made by CT scan (SOMATOM Sensation 4, Siemens AG, Erlangen, Germany) in most cases, or by pulmonary ventilation perfusion scintigraphy (VPS) (Orbiter, Siemens AG, Erlangen, Germany) when CT was contraindicated. Scintigraphy was considered diagnostic if the PLOPED study criteria of high probability were met⁸.

From medical records we obtained the following variables: gender, age, medical history [High blood pressure (hypertension), heart lung disease, previous VTE, surgery and / or immobilization in the last month, active cancer, diabetes, thrombophilia, obesity, cognitive impairment, smoking], history (dyspnea, sudden dyspnea, chest pain, syncope, hemoptysis) and physical examination [Heart rate, blood pressure, breathing rate, pulse oximetry, temperature, and signs of deep vein thrombosis (DVT)]. We also analyzed treatment prescribed, bleeding complications and 30-day mortality.

As complementary examination data, we included posteroanterior and profile chest radiographs, and electrocardiography (ECG).

The technique of D-dimer (D-D) was performed by laboratory technicians under the supervision of a haematologist. The technique used (STALIA TEST D-dimer, Boehringer Mannheim) is based on the degree of turbidity of the plasma after the addition of latex beads coupled to monoclonal anti-DD antibodies¹⁵. D-D concentrations above 500 ng / ml were considered positive.

Results

Eighty three patients with a confirmed diagnosis of PTE were referred to hospital from the ED. Diagnosis of PTE was confirmed with VPS in 42.2% and / or by CT scan in 71.1% of cases. Both diagnostic methods were used in 15 patients where VPS was inconclusive. The average age of patients was 70.8 ± 15 years, 75.9% were over 65 years, and 66.3% were women.

Table 1 details risk factors of PTE in our series, while Table 2 shows vital constants and blood gas parameters on admission to the ED. Clinical characteristics and the main findings of basic laboratory investigations are presented in Table 3.

We determined troponin T in 25 patients, which proved positive (> 0.010 mg / L) in 17 cases. Central pulmonary vessels were affected in 51.8%, and 45.8% were bilateral and multiple. Note that 94.1% of those patients with troponin T values > 0.010 mg / L, the location was bilateral and multiple.

All patients were treated with subcutaneous enoxaparin 1 mg/kg every 12 hours. Four patients initiated fibrinolytic treatment in the ED (2 alteplase, 1 streptokinase and 1 tenecteplase). Six percent of all patients presented bleeding complications; none of the patients receiving fibrinolysis presented such complications. Overall mortality at 30 days was 7.2%.

Table 1. Background and risk factors for venous thromboembolism (VTE)

	N = 83	%
Smoking	9	10.8
Obesity	15	18.1
Lung disease	29	34.9
Heart disease	19	22.9
Hypertension	50	60.2
Previous history of VTE	15	18.1
Previous active neoplasia	13	15.7
Previous surgery	5	6
Cognitive impairment	14	16.9
Immobilization	38	45.8

Table 2. Vital signs and blood gas parameters

	Mean \pm standard deviation
Systolic blood pressure	134.6 \pm 25 mmHg
Diastolic blood pressure	75.9 \pm 16 mmHg
Heart rate	99 \pm 20 bpm
Respiratory rate	27.7 \pm 7 bpm
Temperature	36.5 \pm 0,5°C
SaO ₂ by pulse oximetry	92.7 \pm 6 %
PaO ₂	71.4 \pm 3 mmHg
PaCO ₂	35.4 \pm 7 mmHg
PaO ₂ /FiO ₂	303 \pm 13

SaO₂: arterial oxygen saturation; PaO₂: arterial oxygen pressure;
PaCO₂: arterial pressure of carbon dioxide; PaO₂/FiO₂: Ratio of partial pressure of oxygen divided by fraction inspired oxygen.

Discussion

Patients with a diagnosis of PTE treated at the ED of Hospital del Mar presented different characteristics from those described in previously published series^{10,11}. The most prominent findings were that more than 75% of our patients were older than 65 years, almost half had some type of mobility limitation, none had hemoptysis and a high percentage presented syncope. Other relevant data included: the large proportion of patients with prior immobility, the few post-surgical cases and the high rate of previous lung disease.

Table 3. Clinical and laboratory investigations

	N = 83	%
Physical examination		
Signs of DVT	24	28.9
Venous insufficiency in lower limbs	17	20.5
Tachypnea	75	89.8
Tachycardia	45	54.4
Symptoms		
Dyspnea	71	85.5
Sudden Dyspnea	36	43.4
Chest pain	26	31.3
Syncope	14	16.9
Hemoptysis	0	0
Complementary tests		
S1Q3T3	19	22.9
Right bundle branch block	14	16.9
Negative T waves in precordial	13	15.7
Atrial fibrillation	6	7.2
Hemidiaphragm elevation	19	22.9
Basal atelectasis	4	4.8
Pleural effusion	14	16.9
PaO ₂ \leq 60 mmHg (n = 81)	25	30.9
PaO ₂ < 80 mmHg (n = 81)	60	74.1
PaCO ₂ \leq 35 mmHg (n = 81)	39	48.1
PaCO ₂ > 45 mmHg (n = 81)	6	7.4
PaO ₂ /FiO ₂ \leq 250 mmHg (n = 81)	24	29.6
Troponina T > 0,01 μ g/L (n = 25)	17	68
D-D > 500 ng/mL mmHg	73	87.9

PaO₂: arterial oxygen pressure; PaCO₂: arterial pressure of carbon dioxide; PaO₂/FiO₂: Ratio of PaO₂ divided by the inspired fraction of oxygen. DVT: deep vein thrombosis deep. D-D: D-dimer

Previous studies have shown an association between age and the development of VTE^{12,13}. In our series the mean age was 10 years higher than that of others^{10,11}. Dyspnea was the most frequently recorded symptom in the 3 series, and tachypnea the most prevalent sign. A little over half the patients had a heart rate higher than 100 bpm. It seems relevant to point out the extensive vascular involvement on CT scan and the fact that 12% of patients had D-D values lower than 500 ng / ml, which is a considerably higher percentage than the 7% reported by Jurardo et al.¹⁴.

Certain patient data traditionally considered suggestive of PTE, drawn from Anglo-Saxon series^{10,11}, appear to be infrequent in our setting, as is the case with hemoptysis (in our series we had no cases at all.) Curiously, this is one of the items in the Wells Scale for prediction of pulmonary embolism. Given the lack of specificity of the signs and symptoms of PTE, we believe that such scales should be adapted to the characteristics of the population under study, and perhaps assign greater importance to immobility in pre-test scales.

Classically, syncope has been associated with massive PTE (hemodynamic instability plus severe respiratory failure)¹⁵. It seems relevant to highlight the high rate of syncope found in our patients without meeting haemodynamic instability criteria. One might speculate that in elderly patients with PTE, hypotension could be a common clinical manifestation without necessarily being associated with massive PTE.

In our hospital, fibrinolysis is administered to patients with hemodynamic instability and right heart failure. Notably, we found a low level of fibrinolytic therapy in our study, only 4.8%, due to the low percentage of severe cases of PTE. In 25 patients, the levels of troponin T were elevated in 17 patients. For such patients, Post et al. propose the administration of fibrinolytic therapy¹⁶.

The limitations of this study include the fact that it was carried out in a single centre ED. In addition, although the clinical records were reviewed systematically following an established protocol, this study was retrospective. We would also point out the low rate of postoperative patients, because those with complications arising from surgery are usually in-hospital patients in our setting.

We can conclude from the results of this study that patients with PTE treated in the ED were more elderly than those in previous series and present peculiar clinical manifestations. We would especially stress the high rate of syncope and the absence of hemoptysis. In addition, we found a

low rate of massive PTE and low mortality at 30 days. These findings suggest the need for prospective multicenter studies to validate the use of new scales of pretest diagnostic probability in the Spanish population.

References

- 1 White RH. The epidemiology of venous thromboembolism. *Circulation*. 2003;107:14-8.
- 2 European Consensus Statement. Windsor (UK). 1-5 Nov 1991. Prevention of venous thromboembolism. *International Angiol*. 1992;11:151-9.
- 3 Maínez Saiz C, Moya Mir MS. Nuevas posibilidades de prevención y tratamiento de la enfermedad tromboembólica venosa. *Emergencias*. 2006;18:297-302.
- 4 Estudio ETEVU. Sociedad Española de Medicina de Urgencias y Emergencias. 2002.
- 5 Uresandi F, Blanquer J, Conget F, De Gregorio MA, Lobo JL, Otero R, et al. Guía para el diagnóstico, tratamiento y seguimiento de la tromboembolia pulmonar. *Arch Bronconeumol*. 2004;40:580-94.
- 6 Dismuke SE, Wagener EH. Pulmonary embolism as a cause of death: the changing mortality in hospitalized patients. *JAMA*. 1986;255:2039-42.
- 7 Pila Pérez R, Socarras Olivera N, Hernández Cañete G, Estrada López G. Tromboembolismo pulmonar. Correlación clínica-patológica de 510 pacientes. *Rev Clin Esp*. 1987;181:15-8.
- 8 The PIOPED Investigators. Value of the ventilation/perfusion scan in acute pulmonary embolism: Results of the Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED). *JAMA*. 1990;263:2753-97.
- 9 Ramos A, Montero MC, Luna R, Yagüe J, García MJ, Bañas H. Sensibilidad y valor predictivo negativo del dímero-D en enfermos con enfermedad tromboembólica venosa. *Emergencias*. 2000;12:28-32.
- 10 Le Gal G, Righini M, Roy PM, Sánchez O, Aujesky D, Bounameaux H, et al. Prediction of pulmonary embolism in the emergency department: The revised Geneva Score. *Ann Intern Med*. 2006;144:165-71.
- 11 Wicki J, Perneger TV, Junod AF, Bounameaux H, Perrier A. Assessing clinical probability of pulmonary embolism in the emergency ward. A simple score. *Arch Intern Med*. 2001;161:92-7.
- 12 SilversteinMD, Height J, Morh DN, Petterson TM, O'Fallon WM, Melton LJ. Trends in the incidence of deep vein thrombosis and pulmonary embolism: 25 year population-based study. *Arch Intern Med*. 1998;158:585-93.
- 13 Stein PD, Huang H, Afzal A, Noor HA. Incidence of acute pulmonary embolism in a general hospital: relation to age, sex, and race. *Chest*. 1999;116:909-13.
- 14 Jurado Gámez B, Gutiérrez Solis MA, Ceballos García P, Gutiérrez Jodas J, Gutiérrez Cañones R, García de Lucas MD. Valor del Dímero D para el diagnóstico del tromboembolismo pulmonar en el servicio de urgencias. *Emergencias*. 2000;12:6-11.
- 15 Jiménez D, Díaz G, Valle M, Martí D, Escobar C, Vidal R, et al. El síncope como forma de presentación de la embolia de pulmón: valor pronóstico. *Arch Bronconeumol*. 2005;41:385-8.
- 16 Post F, Mertens D, Sinning C, Peetz D, Münzel T. Decision for aggressive therapy in acute pulmonary embolism: implication of elevated troponin T. *Clin Res Cardiol*. 2009;98:401-8-9.

Presentación clínica del tromboembolismo pulmonar en urgencias: comparación con estudios previos

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Objetivo: Analizar las características clínicas, electrocardiográficas, radiológicas y analíticas de los pacientes que fueron diagnosticados de tromboembolismo pulmonar (TEP) para ver si se ajustan a los referidos en la literatura previa.

Metodología: Se revisaron de manera retrospectiva los informes de alta hospitalaria de los pacientes que ingresaron con la sospecha diagnóstica de TEP, del 1 de enero del 2004 al 31 de diciembre del 2006. Los datos fueron analizados con el paquete estadístico SPSS 14,0.

Resultados: Se confirmó el diagnóstico en 83 pacientes. La edad media fue $70,8 \pm 15$ años. Tenían historia previa de TEP o trombosis venosa profunda (TVP) 18,1%, de neoplasia activa previa el 15,7%, de inmovilización el 45,8%, de dolor torácico el 31,3%, de síncope el 16,9%. En ningún caso se registró hemoptisis. En la exploración se encontraron signos de TVP en el 28,9%, insuficiencia venosa en extremidades inferiores en el 20,5%, taquipnea en el 89,8%, taquicardia en 54,4%. En el ECG se encontró $S_1Q_3T_3$ en el 23,1%, bloqueo de rama derecha en el 16,7%, ondas T negativas en precordiales en el 15,4%. En la radiografía de tórax se observó elevación del hemidiafragma en el 22,8%, atelectasias basales en el 4,8%, derrame pleural en el 16,9%. En la gasometría existía $PaO_2 \leq 60$ en el 30,9%, $PaCO_2 \leq 35$ en el 48,1%. En la angiotomografía presentaron afectación de los vasos pulmonares centrales un 51,8% y en un 45,8% la localización fue bilateral y múltiple. La mortalidad global a los 30 días fue del 7,2%.

Conclusiones: Nuestros pacientes presentan características diferenciales con respecto a series previas. A destacar su mayor edad, la alta tasa de cuadros sincopales, la ausencia de casos de hemoptisis, la baja tasa de TEP masivos y la escasa mortalidad a los 30 días. Estos datos sugieren la necesidad de estudios prospectivos multicéntricos que permitan validar el empleo de nuevas escalas de probabilidad diagnóstica pretest en la población española. [*Emergencias* 2010;22:113-116]

Palabras clave: Tromboembolismo pulmonar. Urgencias. Hemoptisis. Ancianos.