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ORIGINAL ARTICLE

Clinical characterization, risk factors and evolution of pulmonary thromboembolism: A retrospective observational study of a single center.

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Abstract

Introduction: Pulmonary thromboembolism (PTE) is associated with high mortality. It is characterized by the obstruction of a pulmonary artery or its branches by a thrombus that migrates from another area. Its clinical presentation, owing to its wide variety, should be analyzed to achieve early diagnosis and timely treatment. The objective of the study was to describe the history, clinical characteristics, management and evolution of a group of patients diagnosed with PTE admitted to a private referral center.

Materials and Methods: This is a descriptive, observational, retrospective, and unicentric study in which the medical records of 17 patients admitted to Alcívar Hospital between January 2022 and June 2024 with a diagnosis of pulmonary thromboembolism were analyzed.

Results: There were 17 patients, 12 men (70%), with an average age of 62.8 years. The mortality rate was 47.05%. The most representative risk factors were hypertension (52.94%), recent surgery (47.07%) and heart disease and COVID-19 (41.17%). The main signs and symptoms were dyspnea, tachypnea and oxygen desaturation (100%), tachycardia (88%), precordial pain (82%), altered consciousness and cough (64.70%), hemoptysis (11%), and hypotension. arterial pressure and fever (52.94%). The scales applied were the Wells scale, in which 47.05% had a moderate risk and 41.17% had a high risk of suffering from PTE; on the PESI scale, 88.93% had a high risk. The mean D-DIMER concentration was 8579.82 ng/mL, and the mean troponin T concentration was 98.52 ng/L. Anticoagulation treatment included sodium heparin in 29.4% of patients and HBPM in 70.58%; in addition, thrombectomy (23.52%) and inferior vena cava filter implantation (41.17%) were performed.

Conclusions: Risk factors for developing PTE are very important to suspect this pathology; in this study, the main cardiovascular factors were surgery and previous trauma. The clinical picture is very varied, from mild signs and symptoms to very suggestive signs, such as dyspnea, tachypnea, desaturation, chest pain and tachycardia. Some scales help us with the diagnosis and prognosis that together with clinical and complementary tests for early diagnosis and timely treatment to reduce complications and mortality, but as we see in this study, despite a timely diagnosis and adequate combined treatment, the mortality rate remains high, as indicated in the literature.

Keywords:

Mortality, pulmonary thromboembolism, pulmonary embolism.

Abbreviations

AHT: arterial hypertension.
PHT: pulmonary hypertension.
PTE: pulmonary thromboembolism.
DVT: deep vein thrombosis.

Supplementary information

No supplementary materials are declared.

Acknowledgments

We thank the staff and patients of the Alcívar Hospital, where the study was conducted.

Authors' contributions

Eduardo Barrio Núñez, conceptualization, research, original writing-draft, resources, software, supervision.

Ana Cristina Farfán Riera, Methodology, Data Curation, Formal Analysis, Fundraising, Project Management, Validation, Visualization, Writing, Review and Editing.

All the authors read and approved the final version of the manuscript.

Financing

The authors funded this research.

Availability of data and materials

The datasets used and analyzed during this study are available to the corresponding author upon reasonable request.

Introduction

Pulmonary embolism (PTE) refers to the obstruction of the pulmonary artery or one of its branches by material (thrombus) that originates elsewhere in the body. The pathogenesis consists of the formation of thrombi (i.e., Virchow's triad). Virchow's triad consists of venous stasis, endothelial injury, and hypercoagulability [1,2].

PTE is the third leading cause of death among cardiovascular diseases after acute myocardial infarction and stroke [3]. The general incidence is 60–120 per 100,000 people and is higher in men than in women (56 versus 48 per 100,000, respectively). The incidence increases with age, especially in women, so that the PTE exceeds 500 per 100,000 after age 75. In the United States, PTE is responsible for between 60,000 and 100,000 deaths annually [1 -3]. Most emboli are believed to originate in the proximal veins of the lower extremities (iliac, femoral, and popliteal), and more than 50% of patients with deep vein thrombosis (DVT) have concurrent PTE. Risk factors can be classified as hereditary or acquired. More than 50 hereditary risk factors for PTE have been identified, including Factor V Leiden and the prothrombin gene mutation. Acquired risk factors can be subclassified as provocative (e.g., recent surgery, trauma, immobilization, initiation of hormonal therapy, and active cancer) or nonprovoking (e.g., obesity and heavy smoking) [4].

The clinical picture of pulmonary embolism is broad and varies from the absence of symptoms to shock or sudden death. The most common presenting symptoms are dyspnea, followed by chest pain, cough, and deep vein thrombosis symptoms. Hemoptysis is uncommon [5].

PTE can be complicated by recurrent thrombosis, chronic thromboembolic pulmonary hypertension (PHT), and death. PTE, if not treated, has a general mortality of up to 30%, which is significantly reduced with anticoagulation.

In this study, the main risk factors, the most common signs and symptoms in our patients, the complementary exams, the scales applied, and their evolution were analyzed to guide the necessary measures to prevent this pathology, as well as for early diagnosis and treatment.

Materials and methods

Study design

The present study is observational. The source is prospective.

Scenario

The study was conducted in the hemodynamic service of the Alcívar Hospital. The study period was from January 1, 2020, to June 30, 2024.

Participants

Adult patients with a diagnosis of pulmonary thromboembolism confirmed by computed tomography angiotomography of the thorax were included. Pregnant patients were excluded.

Variables

The variables were as follows: I. Sociodemographic and general variables; II. Variables of the risk factors; II. Clinical picture variables; IV. Laboratory test variables: V. Variables of diagnostic and prognostic scales and VI. Variables of types of treatment.

Data sources/measurements

The source was indirect. The data were collected using the institution's computer system, in accordance with privacy and patient consent protocols. The data collected are presented as individual frequencies. Among the laboratory variables, D-DIMER was studied; it was considered positive when greater than 500 ng/ml, and, according to the patient's age, when the ultrasensitive troponin T concentration is greater than 14 ng/ml. Moreover, the higher the value of its result is, the greater the risk of PTE and the worse the prognosis.

Bias

Observation and selection bias were avoided by applying participant selection criteria. The principal investigator always kept the data using a guide and records approved in the research protocol to avoid possible biases of the interviewer, information, and recall. In cases of doubt about the data's standard deviation, corrections were made through in situ reviews of the anomalous data. Two researchers independently analyzed each record in duplicate, and the variables were entered into the database after verifying their agreement.

Study size

The sample was probabilistic. The rate of thromboembolism was 1.9 cases per 100 bone surgeries. At the institution, during the study period, 923 bone surgeries were performed, corresponding to 17 potential cases. With a confidence level of 99.99%, an expected frequency of 50%, and a confidence limit of 5%, the sample size is 17 cases. EPI info TM (StatCalc, EpiInfo, CDC, Atlanta. Version 7.2.6 [October 2023]) was used for the sample calculation.

Quantitative variables

The results are presented as frequencies and percentages. Scale variables were not converted into categorical variables.

Statistical analysis

The qualitative variables were analyzed using frequencies and percentages. Descriptive statistics are used.

Results

Participants

Seventeen patients with a confirmed diagnosis of pulmonary thromboembolism were analyzed.

Characteristics of the study group

A total of 12 patients (70%) were men, 5 (30%) were women, and the average age was 62.8 years (Figure 1). All patients were admitted to the intensive care area, of whom 8 died (47.05%) (Figure 2).

Risk factors

The prevalent factor, such as comorbidities, was the presence of chronic noncommunicable diseases (Table 1). The most prevalent symptoms were dyspnea, tachypnea, desaturation, tachycardia, and chest pain. Pulmonary hypertension (measured by catheterization) was present in 13 patients (76.47%).

Diagnostic scales

The scale used to evaluate the diagnosis was the Wells scale, which showed that 47.05% of patients presented moderate risk, 41.17% high risk, and 11.76% low risk. On the pulmonary thromboembolism severity index scale, 88.93% of the patients were at high risk (Table 1).

Laboratory tests

With respect to the complementary tests, D-DIMER was measured at the time of diagnosis, with a mean value of 8579.82 ng/mL, and troponin T was measured, with a mean value of 98.52 ng/L. In the imaging exams, venous Doppler ultrasound was performed, revealing that 70.80% of patients had deep vein thrombosis. On echocardiogram, 76.47% of patients had pulmonary hypertension (PHT) of varying grades (Table 1).

Treatment

Patients were treated with 29.4% sodium heparin and 70.58% low-molecular-weight heparin. In addition, mechanical thrombectomy was performed in 23.52% of patients, and an inferior vena cava filter was placed in 7 patients (41.17%).

Figure 1. Distribution by gender

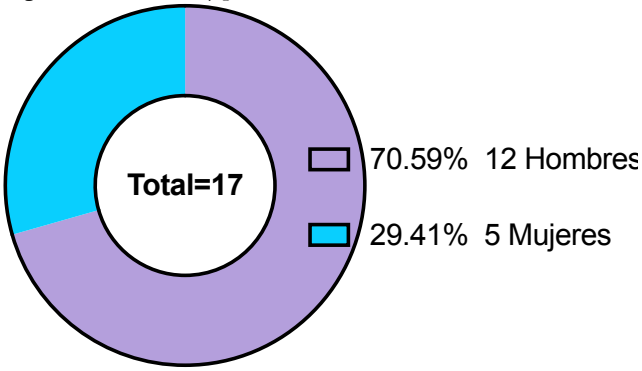

Figure 2. Mortality of the study group.

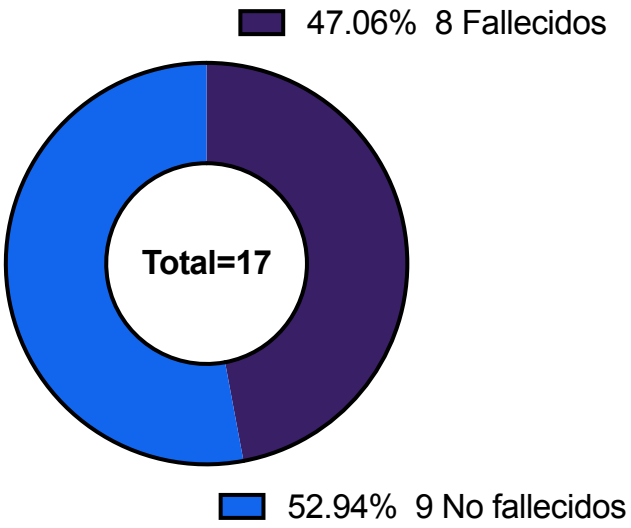

Table 1. Characteristics of the study group.

	N=17
Sex Male	12 (70.6%)
Sex Female	5 (29.4%)
Risk factors	
Arterial hypertension	9 (52.9%)
Surgery	8 (47.1%)
COVID-19	7 (41.2%)
Cardiac E.	7 (41.2%)
Diabetes mellitus type 2	4 (23.5%)
ECV	4 (23.5%)
Trauma	3 (17.6%)
Smoking	3 (17.6%)
Cancer	2 (11.8%)
Obesity	2 (11.8%)
WELLS Scale	
Low	2 (11.8%)
Moderate	8 (47.1%)
High	7 (41.2%)
PESI scale	
High	15 (88.23%)
Moderate	1 (5.9%)
Low	1 (5.9%)
Signs and symptoms	
Dyspnea	17 (100%)
Tachypnea	17 (100%)
Desaturation	17 (100%)
Tachycardia	15 (88.23%)
Chest Pain	14 (82.35%)
Pulmonary hypertension	13 (76.47%)
Deep vein thrombosis	12 (70.58%)
Altered Consciousness	11 (64.7%)
Cough	11(64.7%)
Fever	9 (52.94%)
Hypotension	9 (52.94%)
Hemoptysis	2 (11.76%)
Laboratory	
Troponin T (ng/L) (Average)	98.52 ± 36
D-dimer (ng/ml)	8579.82 ± 2456
Treatment	
Low molecular weight heparin	12 (70.58%)
Vena cava filter	7 (41.17%)
Thrombectomy	4 (23.52%)
Sodium heparin	2 (29.40%)

Discussion

In this case series, 70.58% of the patients with pulmonary thromboembolism were men, and the average age was 62.88 years. In addition, all the patients were admitted to the intensive care area, of whom 8 died (47.05%). These results are similar to those described in other international studies, which have shown a high mortality rate despite the timely use of diagnostic methods and early treatment.

With respect to risk factors, 47% of our patients underwent previous surgery with hospitalization and prolonged rest, which, compared with other studies, coincides with being a high-risk factor for PTE [7,8]. In addition, 41.1% of patients with PTE had a recent positive COVID-19 diagnosis, which is described in several studies that indicate that since the pandemic, COVID-19 is a high-risk factor for PTE [9]. A history of a previous thrombotic event occurred in 23.5% of patients, which is comparable to findings from other studies showing that patients with ischemic CVD or arterial thrombosis have a high risk of PTE and are among the most studied [10].

Several studies have examined obesity (body mass index ≥ 30 kg/m²) as a risk factor for DVT. In this case, obesity was present in 11.7% of patients, a lower rate than reported in other studies [11].

17.64% of patients had a history of trauma that warranted immobilization or surgical treatment. In comparison with other studies, this history is a significant risk factor, especially in trauma with pelvic fracture (70 vs. 47%) or a lower extremity (50% vs. 32%), which should be considered for its prevention [12 -14].

In the imaging exams, venous Doppler ultrasound was performed, which revealed that 70.80% of the patients had deep vein thrombosis, which is in agreement with the findings of multiple studies in which DVT was a predominant risk factor for developing PTE [2]. The clinical presentation of PTE can be very variable, ranging from being asymptomatic to presenting very severe signs and symptoms to reaching shock or death; thus, it is very important to know the most frequent signs and symptoms. In the present study, 100% of the patients presented with symptoms of dyspnea, tachypnea and desaturation, 15 with tachycardia (88.23%), 14 with chest pain (82.35%), 11 with an altered state of consciousness and cough (64.7%), 9 with fever (52.94%), and hemoptysis in only 2 patients (11.76%) and 9 with hypotension requiring the use of vasopressors (52.94%). These findings are in line with those of other studies that have shown similar results, especially regarding dyspnea, tachypnea, and sudden-onset chest pain as the most frequent symptoms, and mild hemoptysis as infrequent [14 -17]. There are scales for diagnosing and assessing the prognosis of patients with PTE. Thus, the Wells score indicated that 47.05% had a moderate risk and 41.17% had a high risk of PTE. Also, on the Wells scale, some studies report that low-risk results may still indicate PTE. In terms of the pulmonary thromboembolism severity index scale, 88.93% of the patients presented a high risk of death, that is, a high risk of death, which was compared with the findings of other studies in which a high PESI resulted in death. that we must assess the clinical picture, the scales, and the complementary tests together [17 -19].

With respect to the complementary tests, D-DIMER was measured, with a mean value of 8579.82, indicating a positive value with a high risk of PTE, which was compared in other studies in which D-DIMER was assessed according to the age of the patient and led to a more probable diagnosis of PTE and unfavorable prognosis. For troponin T, the mean concentration was 98.52 ng/L, and studies have shown that elevated

troponin levels indicate greater severity of PTE due to heart failure, especially of the right ventricle, and a high risk of death. In addition, it helps us identify patients with a low-risk PESI score and elevated troponin levels, which indicate an unfavorable prognosis [20-22].

In 100% of patients, computed tomography angiography was performed as the definitive diagnostic method, as described in the literature and clinical guidelines, and was considered the best [23 -26].

An echocardiogram was performed, in which 76.47% of the patients had different degrees of pulmonary hypertension and right ventricular dysfunction, which, in other studies, was also described and helps to identify patients with a worse prognosis [26].

The patients in this study received treatment with 29.4% sodium heparin and 70.58% low-molecular-weight heparin, consistent with findings from other studies analyzing the use of anticoagulants both intravenously and orally. In our study, thrombectomy was also performed in 23.52% of patients. An inferior vena cava filter was placed in 7 of them (41.17%), which is described in studies in patients in whom this type of treatment benefits and who already cannot receive anticoagulation therapy because of a high risk of bleeding or because this anticoagulant treatment has not been effective [27 -33].

Conclusions

Risk factors for PTE presentation are essential for the suspicion of this pathology. Among the main factors are cardiovascular factors, previous surgeries, and trauma. The clinical picture can range from mild signs and symptoms to very suggestive signs, such as dyspnea, tachypnea, desaturation, chest pain, and tachycardia, which often occur suddenly. Some scales help us in the diagnosis and prognosis of this pathology and that, together with clinical and complementary tests, allow us to diagnose it early and treat it appropriately.

In our case series, despite timely diagnosis and adequate combined treatment, the mortality rate remains high, as indicated by the literature and other studies.

References

1. Zghouzi M, Mwansa H, Shore S, Hyder SN, Kamdar N, Moles VM, Barnes GD, Froehlich J, Mclaughlin VV, Paul TK, Rosenfield K, Giri J, Nallamothu BK, Aggarwal V. Sex, Racial, and Geographic Disparities in Pulmonary Embolism-related Mortality Nationwide. Ann Am Thorac Soc. 2023 Nov;20(11):1571-1577. doi: 10.1513/AnnalsATS.202302-091 °C. PMID: 37555732. https://doi.org/10.1513/AnnalsATS.202302-091OC PMid:37555732

2. Freund Y, Cohen-Aubart F, Bloom B. Acute Pulmonary Embolism: A Review. JAMA. 2022 Oct 4;328(13):1336-1345. doi: 10.1001/jama.2022.16815. PMID: 36194215. https://doi.org/10.1001/jama.2022.16815 PMid:36194215

3. Tagalakis V, Patenaude V, Kahn SR, Suissa S. Incidencia y mortalidad por tromboembolia venosa en una población del mundo real: la cohorte del estudio Q-VTE. Am J Med 2013; 126:832.e13. https://doi.org/10.1016/j.amjmed.2013.02.024 PMid:23830539

4. Stein PD, Beemath A, Matta F, et al. Características clínicas de pacientes con embolia pulmonar aguda: datos de PIOPED II. Am J Med 2007; 120:871. https://doi.org/10.1016/j.amjmed.2007.03.024 PMid:17904458 PMCid:PMC2071924

5. https://www.uptodate.com/contents/clinical-presentation-evaluation-and-diagnosis-of-the-non-pregnant-adult-with-suspected-acute-pulmonary-embolism/abstract/9

6. Zuin M, Bikdeli B, Davies J, Krishnathasan D, Rigatelli G, Roncon L, Bilato C, Piazza G. Contemporary trends in mortality related to high-risk pulmonary embolism in US from 1999 to 2019. Thromb Res. 2023 Aug;228:72-80. doi: 10.1016/j.thromres.2023.05.028. Epub 2023 Jun 5. PMID: 37295022. https://doi.org/10.1016/j.thromres.2023.05.028 PMid:37295022

7. Lutsey PL, Zakai NA. Epidemiology and prevention of venous thromboembolism. Nat Rev Cardiol. 2023 Apr;20(4):248-262. doi: 10.1038/s41569-022-00787-6. Epub 2022 Oct 18. PMID: 36258120; PMCID: PMC9579604. https://doi.org/10.1038/s41569-022-00787-6 PMid:36258120 PMCid:PMC9579604

8. White RH, Zhou H, Romano PS. Incidence of symptomatic venous thromboembolism after different elective or urgent surgical procedures. Thromb Hemost. 2003 Sep;90(3):446-55. doi: 10.1160/TH03-03-0152. PMID: 12958614.
https://doi.org/10.1160/TH03-03-0152
PMid:12958614

9. Poor HD. Pulmonary Thrombosis and Thromboembolism in COVID-19. Chest. 2021 Oct;160(4):1471-1480. doi: 10.1016/j.chest.2021.06.016. Epub 2021 Jun 19. PMID: 34153340; PMCID: PMC8213519.
https://doi.org/10.1016/j.chest.2021.06.016
PMid:34153340 PMCid:PMC8213519

10. Tøndel BG, Morelli VM, Hansen JB, Braekkan SK. Risk factors and predictors for venous thromboembolism in people with ischemic stroke: A systematic review. J Thromb Hemost. 2022 Oct;20(10):2173-2186. doi: 10.1111/jth.15813. Epub 2022 Jul 28. PMID: 35815351; PMCID: PMC9796787.
https://doi.org/10.1111/jth.15813
PMid:35815351 PMCid:PMC9796787

11. Ntinopoulou P, Ntinopoulou E, Papathanasiou IV, Fradelos EC, Kotsiou O, Roussas N, Raptis DG, Gourgoulianis KI, Malli F. Obesity as a Risk Factor for Venous Thromboembolism Recurrence: A Systematic Review. Medicina (Kaunas). 2022 Sep 16;58(9):1290. doi: 10.3390/medicina58091290. PMID: 36143967; PMCID: PMC9503246.
https://doi.org/10.3390/medicina58091290
PMid:36143967 PMCid:PMC9503246

12. Thorson CM, Ryan ML, Van Haren RM, Curia E, Barrera JM, Guarch GA, Busko AM, Namias N, Livingstone AS, Proctor KG. Venous thromboembolism after trauma: a never event?*. Crit Care Med. 2012 Nov;40(11):2967-73. doi: 10.1097/CCM.0b013e31825bcb60. PMID: 22890248.
https://doi.org/10.1097/CCM.0b013e31825bcb60
PMid:22890248

13. Monreal Bosch M. Registro Informatizado de Pacientes con Enfermedad Tromboembólica (RIETE) [Internet]. 2001 [citado 27 mayo 2022]. Disponible en: https://www.riete.org/info/general/index.php

14. Stein PD, Beemath A, Matta F, Weg JG, Yusen RD, Hales CA, Hull RD, Leeper KV Jr, Sostman HD, Tapson VF, Buckley JD, Gottschalk A, Goodman LR, Wakefied TW, Woodard PK. Clinical characteristics of patients with acute pulmonary embolism: data from PIOPED II. Am J Med. 2007 Oct;120(10):871-9. doi: 10.1016/j.amjmed.2007.03.024. PMID: 17904458; PMCID: PMC2071924.
https://doi.org/10.1016/j.amjmed.2007.03.024
PMid:17904458 PMCid:PMC2071924

15. Stein PD, Henry JW. Clinical characteristics of patients with acute pulmonary embolism stratified according to their presenting syndromes. Chest. 1997 Oct;112(4):974-9. doi: 10.1378/chest.112.4.974. PMID: 9377961.
https://doi.org/10.1378/chest.112.4.974
PMid:9377961

16. Dix C, Tran H. Pulmonary embolus. Aust J Gen Pract. 2022 Sep;51(9):667-671. doi: 10.31128/AJGP-05-22-6440. PMID: 36045622.
https://doi.org/10.31128/AJGP-05-22-6440
PMid:36045622

17. Chan CM, Woods C, Shorr AF. The validation and reproducibility of the pulmonary embolism severity index. J Thromb Hemost. 2010 Jul;8(7):1509-14. doi: 10.1111/j.1538-7836.2010.03888.x. Epub 2010 Apr 16. PMID: 20403093.
https://doi.org/10.1111/j.1538-7836.2010.03888.x
PMid:20403093

18. Donzé J, Le Gal G, Fine MJ, Roy PM, Sanchez O, Verschuren F, Cornuz J, Meyer G, Perrier A, Righini M, Aujesky D. Prospective validation of the Pulmonary Embolism Severity Index. A clinical prognostic model for pulmonary embolism. Thromb Hemost. 2008 Nov;100(5):943-8. doi: 10.1160/th08-05-0285. PMID: 18989542.
https://doi.org/10.1160/TH08-05-0285
PMid:18989542

19. Kirsch B, Aziz M, Kumar S, Burke M, Webster T, Immadi A, Sam M, Lal A, Estrada-Y-Martin RM, Cherian S, Aisenberg GM. Wells Score to Predict Pulmonary Embolism in Patients with Coronavirus Disease 2019. Am J Med. 2021 May;134(5):688-690. doi: 10.1016/j.amjmed.2020.10.044. Epub 2020 Dec 11. PMID: 33316254; PMCID: PMC7732230.
https://doi.org/10.1016/j.amjmed.2020.10.044
PMid:33316254 PMCid:PMC7732230

20. Bajaj A, Saleeb M, Rathor P, Sehgal V, Kabak B, Hosur S. Prognostic value of troponins in acute nonmassive pulmonary embolism: A meta-analysis. Heart Lung. 2015 Jul-Aug;44(4):327-34. doi: 10.1016/j.hrtlng.2015.03.007. Epub 2015 May 11. PMID: 25976228.
https://doi.org/10.1016/j.hrtlng.2015.03.007
PMid:25976228

21. Lippi G, Favaloro EJ, Kavsak P. Measurement of High-Sensitivity Cardiac Troponin in Pulmonary Embolism: Useful Test or a Clinical Distraction. Semin Thromb Hemost. 2019 Nov;45(8):784-792. doi: 10.1055/s-0039-1698762. Epub 2019 Oct 17. PMID: 31622992.
https://doi.org/10.1055/s-0039-1698762
PMid:31622992

22. Bi W, Liang S, He Z, Jin Y, Lang Z, Liu H, Wang Y, Li S. The Prognostic Value of the Serum Levels of Brain Natriuretic Peptide, Troponin I, and D-Dimer, in Addition to the Neutrophil-to-Lymphocyte Ratio, for the Disease Evaluation of Patients with Acute Pulmonary Embolism. Int J Gen Med. 2021 Jan 28;14:303-308. doi: 10.2147/IJGM.S288975. PMID: 33536777; PMCID: PMC7850564
https://doi.org/10.2147/IJGM.S288975
PMid:33536777 PMCid:PMC7850564

23. Ding J, Yue X, Tian X, Liao Z, Meng R, Zou M. Association between inflammatory biomarkers and venous thromboembolism: a systematic review and meta-analysis. Thromb J. 2023 Jul 31;21(1):82. doi: 10.1186/s12959-023-00526-y. PMID: 37525162; PMCID: PMC10388478.
https://doi.org/10.1186/s12959-023-00526-y
PMid:37525162 PMCid:PMC10388478

24. Ma M, Li Y, Xu X, Ji C. Early diagnosis for pulmonary embolism: A systematic review and meta-analysis. Medicine (Baltimore). 2023 Jul 14;102(28):e34352. doi: 10.1097/MD.0000000000034352. PMID: 37443488; PMCID: PMC10344512.
https://doi.org/10.1097/MD.0000000000034352
PMid:37443488 PMCid:PMC10344512

25. Monreal Bosch M. Registro Informatizado de Pacientes con Enfermedad Tromboembólica (RIETE) [Internet]. 2001 [citado 27 mayo 2022]. Disponible en: https://www.riete.org/info/general/index.p}

26. ten Wolde M, Söhne M, Quak E, et al. Valor pronóstico de la disfunción ventricular derecha evaluada ecocardiográficamente en pacientes con embolia pulmonar. Arch Intern Med 2004; 164:1685.
https://doi.org/10.1001/archinte.164.15.1685
PMid:15302640

27. Ortel TL, Neumann I, Ageno W, Beyth R, Clark NP, Cuker A, Hutten BA, Jaff MR, Manja V, Schulman S, Thurston C, Vedantham S, Verhamme P, Witt DM, D Florez I, Izcovich A, Nieuwlaat R, Ross S, J Schünemann H, Wiercioch W, Zhang Y, Zhang Y. American Society of Hematology 2020 guidelines for management of venous thromboembolism: treatment of deep vein thrombosis and pulmonary embolism. Blood Adv. 2020 Oct 13;4(19):4693-4738. doi: 10.1182/bloodadvances.2020001830. PMID: 33007077; PMCID: PMC7556153.
https://doi.org/10.1182/bloodadvances.2020001830
PMid:33007077 PMCid:PMC7556153

28. Palm V, Rengier F, Rajiah P, Heussel CP, Partovi S. Acute Pulmonary Embolism: Imaging Techniques, Findings, Endovascular Treatment and Differential Diagnoses. Rofo. 2020 Jan;192(1):38-49. English. doi: 10.1055/a-0900-4200. Epub 2019 May 28. PMID: 31137046.
https://doi.org/10.1055/a-0900-4200
PMid:31137046

29. Bashir R, Foster M, Iskander A, et al. Trombólisis farmacomecánica dirigida por catéter con el catéter endovascular Bashir para la embolia pulmonar aguda: el estudio RESCUE. JACC Cardiovasc Interv 2022; 15:2427.
https://doi.org/10.1016/j.jcin.2022.09.011
PMid:36121244

30. Stein PD, Matta F, Keyes DC, Willyerd GL. Impacto de los filtros de vena cava en la tasa de mortalidad hospitalaria por embolia pulmonar. Am J Med 2012; 125:478.
https://doi.org/10.1016/j.amjmed.2011.05.025
PMid:22310013

31. Zuo Z, Yue J, Dong BR, Wu T, Liu GJ, Hao Q. Thrombolytic therapy for pulmonary embolism. Cochrane Database Syst Rev. 2021 Apr 15;4(4):CD004437. doi: 10.1002/14651858.CD004437.pub6. PMID: 33857326; PMCID: PMC8092433.
https://doi.org/10.1002/14651858.CD004437.pub6
PMid:33857326 PMCid:PMC8092433

32. Shuster R, Mathew J, Olaussen A, Gantner D, Varma D, Koukounaras J, Fitzgerald MC, Cameron PA, Mitra B. Variables associated with pulmonary thromboembolism in injured patients: A systematic review. Injury. 2018 Jan;49(1):1-7. doi: 10.1016/j.injury.2017.08.024. Epub 2017 Aug 18. PMID: 28843717.
https://doi.org/10.1016/j.injury.2017.08.024
PMid:28843717

33. Yaghoobpoor S, Fathi M, Taher HJ, Farhood AJ, Bahrami A, Eshraghi R, Hajibeygi R, Tutunchian Z, Myers L, Ahmadi R, Gholamrezanezhad A. Computed tomography pulmonary angiography (CTPA) for the detection of pulmonary embolism (PE) among trauma patients: a systematic review and meta-analysis. Emerg Radiol. 2024 Aug;31(4):567-580. doi: 10.1007/s10140-024-02249-7. Epub 2024 Jun 7. PMID: 38844660; PMCID: PMC11289063.
https://doi.org/10.1007/s10140-024-02249-7
PMid:38844660 PMCid:PMC11289063

Clinical characterization, risk factors and evolution of pulmonary thromboembolism: A single-center retrospective observational study.

Abstract

Introduction: Pulmonary thromboembolism (PTE) has a high mortality rate. It is characterized by blockage of a pulmonary artery or its branches by a thrombus that migrates from another location. Because of its wide range of clinical manifestations, careful analysis is necessary for early diagnosis and prompt treatment. The aim of this study was to describe the background, clinical features, management, and progression of a group of patients who were diagnosed with PE and admitted to a private referral center.

Materials and Methods: This is a descriptive, observational, retrospective, single-center study in which the medical records of 17 patients admitted to Alcívar Hospital between January 2022 and June 2024 with a diagnosis of pulmonary thromboembolism were analyzed.

Results: Seventeen patients (12 men, 70%) with a mean age of 62.8 years were included. The mortality rate was 47.05%. The most representative risk factors were hypertension (52.94%), recent surgery (47.07%), and heart disease and COVID-19 (41.17%). The main signs and symptoms were dyspnea, tachypnea, oxygen desaturation (100%), tachycardia (88%), chest pain (82%), altered consciousness and cough (64.70%), hemoptysis (11%), hypotension, and fever (52.94%). The scales applied were the Wells scale, in which 47.05% had a moderate risk and 41.17% had a high risk of suffering from PTE; on the PESI scale, 88.93% were at high risk. The mean DIMER D concentration was 8579.82 ng/mL, and the mean troponin T concentration was 98.52 ng/L. Anticoagulation treatment included sodium heparin (29.4%) and LMWH (70.58%). In addition, thrombectomy (23.52%) and inferior vena cava filter implantation (41.17%) were performed.

Conclusions: Risk factors for developing PE are important for predicting this condition. In this study, the main cardiovascular factors, previous surgeries, and trauma were identified. The clinical presentation varies widely, from mild signs and symptoms to more suggestive indicators such as dyspnea, tachypnea, desaturation, chest pain, and tachycardia. Some scales assist in diagnosis and prognosis, which, together with clinical assessments and additional tests, enable early and timely treatment to reduce complications and mortality. However, despite early diagnosis and adequate combined treatment, the mortality rate remains high, as noted in the literature.

Keywords: Mortality, pulmonary thromboembolism, pulmonary embolism.

Statements

Ethics committee approval and consent to participate

The bioethics committee of the Faculty of Medical Sciences of the UEES University approved the study.

Consent for publication

This information was not needed, since the present study did not publish images, radiographs or specific studies of patients.

Conflicts of interest

This research has no financial interests or conflicts of interest.

Use of generative AI

The authors declare that they use generative AI responsibly, without replacing the critical thinking, experience and judgment of the authors. AI was used under supervision and control to develop the discussion section. The use of the AI tool maintains the privacy and confidentiality of the data and contributions, including published and unpublished manuscripts, as well as any personally identifiable information.

Only limited rights are granted to AI to provide a service.

The accuracy, integrity and impartiality of all the results generated by AI were carefully reviewed and verified to ensure that the manuscript reflects an authentic and original contribution.

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Editor's Note

The Journal Actas Médicas (Ecuador) remains neutral with respect to jurisdictional claims regarding published maps and institutional affiliations.

Received: *August 23, 2025.*
Accepted: *November 2, 2025.*
Published: *November 5, 2025.*
Editor*: Dr. Mayra Ordoñez Martínez.*

How to cite:

Barrio E, Farfán A. Clinical characterization, risk factors and evolution of pulmonary thromboembolism: a single-center retrospective observational study. Actas Médicas (Ecuador) 2025; 35 (2): 190-199.

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