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Severe Pulmonary Embolism Care at Kara Teaching Hospital

Tchaa Tcherou[1*], Borgattia D. Atta[1], Komlavi Yayehd[2], Abalo Mario Bakai[1], Jésugnon A. A. Houeto[1], Lihalimpo Djalogue[3], Essosimina Pyabalou Tchaou[1], Sylvain Mbaidedjim[1], N'Douba Octave[1], Machihude Pio[1]

[1]Department of Cardiology, Faculty of Health Sciences, University of Kara, Kara, Togo
[2]Department of Cardiology, Faculty of Health Sciences, University of Lomé, Lomé, Togo
[3]Department of Internal Medicine, Faculty of Health Sciences, University of Kara, Kara, Togo
Email: *tcheroutchaa@yahoo.fr

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Abstract

Objective: To describe the epidemiological, diagnostic, therapeutic data and access outcomes of severe pulmonary embolism (PE) in the Cardiology Department of Kara Teaching Hospital. **Materials and Methods:** This was a cross-sectional study with retrospective data collection, carried out from January 2022 to June 2023 in the Cardiology Department of Kara Teaching Hospital. The study included the records of inpatients for severe PE diagnosed on the basis of clinical, ultrasound and angioscan findings. **Results:** During our study period, 42 patients were hospitalised for PE. Of these, 13 patients were treated for severe PE (30.9%). The mean age of these patients was 52.7 years, with a predominance of women (sex ratio M/F = 0.3). The average time to admission to cardiology was 4.7 ± 2.8 days. Thromboembolic risk factors were dominated by cancer (23.1%), pregnancy and childbirth (15.4%), HIV (15.4%) and prolonged immobilisation (15.4%). Ultrasound signs of acute pulmonary heart disease were present in all patients, with thrombus in the right cavities in three patients. Thoracic angioscan showed proximal involvement in 100% of cases and bilateral involvement in 50%. Streptokinase was the only thrombolytic agent used in 12 patients. Anticoagulant treatment in the acute phase was unfractionated heparin in 53.8% of cases and low molecular weight heparin in 46.2%, followed by oral anticoagulants (77.8%) and vitamin K antagonists (22.2%). The average hospital stay was 12.3 ± 5.2 days, with an in-hospital death rate of 30.8%. **Conclusion:** Severe PE remains a frequent medical emergency with a high mortality rate in our department, hence the need for better organisation of care services and improved technical facilities to improve patient prognosis.

Keywords

Severe Pulmonary Embolism, Diagnosis, Treatment, Prognosis, Togo

1. Introduction

Pulmonary embolism (PE) is the sudden, total or partial obliteration of the trunk of the pulmonary artery or one of its branches by a blood clot, most often resulting from deep vein thrombosis (DVT) [1] [2]. PE is common in developed countries and is the 3rd most common acute cardiovascular syndrome after myocardial infarction and stroke [3]-[5]. In France in 2010, the incidence of PE was 85.8 cases per 100,000 inhabitants [6]. In Africa, data on venous thromboembolic (VTE) diseases are still difficult to obtain and the frequency is often underestimated because of difficulties linked to the scarcity of diagnostic resources [7] [8]. In 2019, in a study carried out in the southern part of Togo, Pessinaba *et al.* reported a frequency of 5% for severe PE [9]. PE is said to be severe when it is associated with shock or haemodynamic instability [10] [11]. The 3-month mortality rate for severe PE is very high, approaching 50%, with most deaths occurring immediately after diagnosis, justifying emergency treatment with drugs, intervention or surgery [12] [13]. Data on severe PE are even rarer, especially in developing countries. This explains the rationale behind this study of severe PE in a specialised department, the objectives of which were to determine its prevalence in hospitals and to describe its epidemiological, diagnostic, therapeutic and evolutionary characteristics.

2. Materials and Methods

2.1. Study Setting

This study took place in the Cardiology Department of the Teaching Hospital Centre of Kara, which is the reference center for the management of cardiovascular diseases in the northern part of Togo. The Cardiology Department of Kara Teaching Hospital has not only qualified human resources but also an adequate technical platform for the diagnosis and management of cardiovascular emergencies, including severe PE.

2.2. Type and Period of Study

This was a descriptive cross-sectional study with retrospective data collection on the records of patients hospitalised for severe PE during the period from January 2022 to June 2023, *i.e.*, a period of eighteen months.

2.3. Study Population

This study included all the records of patients hospitalised in the Cardiology Department of Kara Teaching Hospital during the study period. The study included the records of patients in whom the diagnosis of pulmonary embolism was con-

firmed on thoracic angioscan or cardiac Doppler ultrasound, finding a thrombus in the right heart chambers or in the trunk of the pulmonary artery associated with clinical signs of severity, in particular haemodynamic shock or haemodynamic instability. Records of patients hospitalised for suspected severe pulmonary embolism but not confirmed by thoracic angioscan or cardiac Doppler ultrasound were excluded. For patients who did not undergo thoracic angioscan, chest X-rays ruled out pulmonary causes.

2.4. Protocol and Parameters of the Study

A study protocol and survey form were drawn up beforehand and validated by the local ethics committee. These survey forms were filled in from the patient registers and files stored by year in the archive storage room. Once all the files had been found, we filled in the survey forms, taking into account the following parameters: socio-demographic (age and sex); clinical (time of admission, VTE risk factors, functional signs, general and physical signs); paraclinical (biological, electrical, ultrasound and scannographic signs); therapeutic and evolutionary (length of hospitalisation and mortality). The therapeutic protocol for thrombolysis is based on the exclusive use of streptokinase at 1.5 million international units according to the short protocol (90 minutes of infusion). For this treatment, the absolute and relative contraindications were respected and after each thrombolysis, strict monitoring made it possible to identify complications. Apart from their contraindications, the choice of direct oral anticoagulants (DOACs) depends on the patient's ability to pay for this medication, which is more expensive than vitamin K antagonists (VKAs).

2.5. Operational Definitions

The diagnosis of pulmonary embolism was confirmed either on thoracic angioscan by the presence of a defect in the pulmonary artery or its branches or on cardiac Doppler ultrasound by the presence of thrombi in the right heart chambers.

Cardiogenic shock was defined according to the 2019 ESC guidelines on PE, by a systolic blood pressure (SBP) of less than 90 mmHg or a drop of more than 40 mmHg in SBP for more than 15 minutes and this in the absence of a serious arrhythmia, or hypovolaemia or sepsis [10].

Haemodynamic instability was defined by the presence of one of the following: recovered cardiac arrest, the need for vasopressor amines or the presence of peripheral signs of shock: neurological (agitation, obnubilation, and coma); renal (oliguria, anuria); pulmonary (polypnoea, desaturation); cutaneous (cold extremities) [10].

Tachypnoea or polypnoea was defined as a respiratory rate greater than 24 cycles per minute.

Tachycardia was defined as a heart rate greater than or equal to 100 beats per minute.

The right heart failure syndrome was defined by the presence of at least two of

the following signs: exertional or resting hepatalgia, exertional dyspnoea, spontaneous Jugular veinous distension, hepatomegaly with hepatojugular reflux and oedema of the lower limbs.

The clinical probability of PE was assessed using the wells score, which distinguishes three levels of probability: low, intermediate and high.

For the major bleeding, we include intracerebral hemorrhages and gastrointestinal bleeding. Minor bleeding refers to skin and ENT bleeding.

2.6. Data Processing and Analysis

The data collected on the survey forms were entered and analysed using Epi Info 7.2.2.6, Microsoft Word and Excel. Quantitative variables were presented in the form of averages with standard deviations, while qualitative variables were presented in the form of numbers followed by percentages.

3. Results

3.1. Epidemiological Data

During the study period, 418 patients were hospitalised in the Cardiology Department, including 42 cases of PE (42/418 = 10.1%). Of the 42 cases of PE, we recorded 13 cases of severe PE, which represents a prevalence of 30.9% (13/42) or 3.1% (13/418), making up our study sample. More than three-quarters of the cases (10/13 = 76.9%) of severe PE occurred during the dry season between November and May. The mean age of the patients was 52.7 ± 15.9 years, with extremes of 26 and 77 years. More than half of patients (7/13 = 53.8%) were aged over 50, and the age group most affected was [60 - 70], with a total of 4 cases out of 13. There was a strong female predominance, with 10 women and 3 men (sex ratio M/F = 0.3).

Table 1. Distribution of patients according to clinical signs on admission.

	Number	Percentage
Symptoms		
- Dyspnoea	12	92.3
- Chest pain	7	53.8
- Palpitations	6	46.1
- Syncope	5	38.5
- Painful swelling of the lower limb	4	30.8
- Coughing	2	15.4
- Haemoptysis	2	15.4
VTE risk factors		
- Cancer	3	23.1
- Pregnancy and childbirth	2	15.4
- HIV	2	15.4

Continued

-	Immobilisation for medical pathology	2	15.4
-	Immobilisation in plaster cast	1	7.6
-	No factors found	3	23.1
Oxygen saturation			
-	Normal saturation (SaO_2: 95% - 100%)	2	15.4
-	Moderate desaturation (SaO_2: 90% - 94%)	1	7.7
-	Deep desaturation (SaO_2 < 90%)	10	76.9
Physical signs			
-	Brightness of B2 lung	12	92.3
-	Basal pulmonary condensation	3	23.1
-	Right heart failure syndrome	10	76.9
-	Unilateral inflammatory limb oedema	4	30.8
Clinical probability (wells score)			
-	Intermediate	8	61.5
-	Strong	5	38.5

VTE = Venous thromboembolism, HIV = Human immunodeficiency virus.

3.2. Clinical Data

The mean time to admission of patients to cardiology (ICU) from the onset of symptoms was 4.7 ± 2.8 days (extremes 2 and 12 days). Functional signs were dominated by dyspnoea and chest pain. Risk factors for venous thromboembolism were dominated by neoplasia in 23% of cases. Ten patients (79.9%) presented with tachycardia and 12 patients (92.3%) with tachypnoea. Table 1 summarises all the clinical characteristics of the sample.

3.3. Paraclinical Examinations

All patients were able to undergo basic morphological examinations, the results of which are shown in Table 2. Biologically, troponin I was elevated in 50% of patients, while NT pro BNP was elevated in all patients. On admission, the risk of mortality was immediately high in 10 patients (76.9%) and intermediately high in three patients (23.1%).

Table 2. Results of morphological examinations.

	Number	Percentage
Electrical abnormalities		
- Negative T waves from V1 to V3	12	92.3
- Tachycardia	9	69.2
- RBBB (complete and incomplete)	9	69.2
- S1Q3T3 appearance	8	61.5

Continued

- Supraventricular rhythm disorder	3	23.1
- Right axial deviation	3	23.1
Chest X-ray		
- Large hilum + convexity of the left middle arch	12	92.3
- Pulmonary hyperlucency	12	92.3
- Raised diaphragmatic dome	7	53.8
- Pleuresis	2	15.4
- Atelectasis band	1	7.7
Cardiac Doppler ultrasound		
- Right ventricular systolic dysfunction	13	100
- Pulmonary arterial hypertension	13	100
- Dilation of the right cavities	13	100
- Paradoxical septum	13	100
- McConnell 60/60 sign	13	100
- Significant tricuspid insufficiency	6	46.2
- Dilatation of the pulmonary artery trunk	5	38.5
- Thrombus present in the right cavities	3	23.1
Venous Doppler ultrasound of the lower limbs		
- Presence of deep vein thrombosis	13	100
- Presence of superficial venous thrombosis	3	23.1
Thoracic angioscan (10 cases)		
- Bilateral proximal pulmonary embolism	5	50
- Bilateral proximal-distal pulmonary embolism	3	30
- Proximal right pulmonary embolism	1	10
- Left proximal pulmonary embolism	1	10
- Pulmonary arterial hypertension	7	70
- Presence of serious signs	2	20
- Impact on right heart chambers	7	70

RBBB = Right bundle branch block.

3.4. Therapeutic and Follow-Up Data

All patients received oxygen therapy at an average flow rate of 7.2 ± 2.6 l/min (extremes of 3 and 12 l/min). Stereptokinase was the only thrombolytic available and was used in 12 patients (92.3%). One patient did not receive thrombolysis because the drug was unavailable. No major bleeding after the thrombolysis, but only one person had cutaneous bleeding. The rest of the anticoagulant and adjuvant treatment is shown in Table 3. The average length of hospital stay was 12.3 ± 5.2 days, with extremes of 1 and 23 days. Four cases of death were recorded during

hospitalisation, representing 30.8% of in-hospital mortality. Mortality in thrombolysed patients was 25%.

Table 3. Breakdown of patients according to treatment received.

	Number	Percentage
Acute anticoagulant treatment		
- Unfractionated heparin	7	53.8
- Low molecular weight heparin	6	46.2
Anticoagulant treatment in survivors (9 cases)		
- Direct oral anticoagulants	7	77.8
- Antivitamins K	2	22.2
Vasopressor amines		
- Dobutamine	5	38.5
- Adrenaline	4	30.7
- Noradrenaline	2	15.4
Other treatments		
- Isotonic glucose serum (IS)	13	100
- Lactulose	13	100
- Corticosteroid therapy prior to thrombolysis	12	92.3
- Proton pump inhibitors	13	100
- Antibiotic therapy	7	53.9
- Paracetamol	4	30.7
- Compression stockings	7	53.9

4. Discussion

We carried out a descriptive cross-sectional study on one of the most life-threatening cardiovascular emergencies, severe PE, the management of which consists of unblocking the occluded pulmonary artery. The aim of this study was to investigate the epidemiological, diagnostic, therapeutic and evolutionary aspects of severe PE in a specialised department. The prevalence of severe PE as a proportion of all PE was 30.9%, with a strong female predominance. This high proportion of severe pulmonary embolism is found in almost all studies conducted in the subregion, such as Houenassi *et al.* in Benin (38.46%) and Pessinaba *et al.* in Togo (27.5%) [9] [14]. This high rate of severe PE is thought to be due to delayed diagnosis. In Western countries, however, the proportion of severe PE is much lower, at around 5% [15]. Patients with severe PE on the African continent are relatively younger than those in Western countries, where life expectancy is higher [6]-[16]. In our study, we noted a strong female predominance, in line with the findings of most authors [9] [17] [18]; however, some authors have also reported a male predominance in their series [14]. In our study, we noted a large number of PE cases

between November and May. This period of the year is characterised by high temperatures in our country, which suggests that heat could be a factor favouring thrombus formation.

PE is often promoted by factors that may be transient or permanent. In our study, neoplastic factors were the most common, accounting for 23.1% of cases. This rate is similar to general data on the causes of venous thromboembolic disease (VTE), which estimates that 20% of patients with VTE have an active cancer [19]. Higher rates of active cancer (40%) have been reported by some authors, particularly for specific sites such as thrombosis of the upper limb [20]. Classically, cancer is involved in the development of VTE through the three mechanisms of Virchow's triad: blood stasis through immobilisation or compression, hypercoagulability through activation of coagulation factors, and damage to the vascular endothelium through the effects of chemotherapy and other therapeutic techniques [19].

Generally, the clinical diagnosis of severe PE is classic, with symptoms such as dyspnoea and chest pain in the presence of VTE risk factors associated with signs of cardiogenic shock. In our study, these two symptoms were reported in 92.3% and 53.8% of cases, respectively. Pessinaba *et al.* in Togo and Adam *et al.* in Chad also found dyspnoea and chest pain to be the most frequent symptoms [17]-[21]. Syncope is one of the signs of severity, but it is not sufficient in itself to indicate a PE with a high mortality risk [22]. Syncope was 38.5% in our study but may also be rarer as in the series by Doghmi *et al.*, who reported no cases of syncope in a sample of 20 patients with severe PE [23].

From a paraclinical point of view, the signs indicative of PE was found in almost all the patients, reflecting a delay in diagnosis related to the delay in consulting the patients. The most frequent electrocardiographic signs were sinus tachycardia, anteroseptal subepicardial ischaemia, intraventricular conduction abnormalities and right axial position, found in 92.3% of patients. As for the echocardiographic signs of acute pulmonary heart disease (dilatation of the right cavities with ventricular systolic dysfunction, pulmonary arterial hypertension, paradoxical septum and McConnell 60/60 sign), they were found in 100% of cases. All these signs have been described in the literature as signs of severe PE when associated with shock or haemodynamic instability [10] [24]. Venous Doppler of the lower limbs showed a high rate of thrombosis (100%) compared with Doghmi *et al.* in Morocco, who found only 50% thrombosis in patients with severe PE [23]. Thoracic angioscan is the test of choice for confirming PE, but in the event of haemodynamic instability or shock, the discovery of a thrombus in the peripheral veins or right heart chambers can confirm the diagnosis of PE [2] [10]. In our study, the presence of thrombus in the right heart chambers in three patients led to the conclusion of PE, while angioscan was only performed in 10 patients. The thrombus was proximal in all ten patients and bilateral in half (5 patients). These results corroborate data in the literature according to which the more proximal and bilateral the thrombus, the worse the prognosis, since the mortality rate is very high, approach-

ing 50% during the first three months [12] [13].

Treatment of severe PE is an emergency and consists of unblocking the occluded artery by medication (thrombolysis), intervention (thrombectomy, thromboaspiration) or surgery (embolectomy). However, in developing countries such as Togo, the treatment most often available is thrombolysis with first-generation molecules such as streptokinase. This is the molecule received by all our patients (12 patients) according to the short protocol at a dosage of 1.5 million, offering efficacy and safety comparable to those of alteplase [25]. Apart from thrombolysis, the treatment of severe PE consisted of ensuring good oxygenation and maintaining good haemodynamic stability by administering vasopressor amines as required. The in-hospital outcome in our study was marked by a high mortality rate of over 30%. The mortality rate in our study is higher than that of Pessinaba *et al.* in Togo, who reported a mortality rate of 13.6% [9]. The high mortality rate in our department is explained by the delay in treatment (diagnostic delay due to the very long admission time and therapeutic delay due to patients' difficulties in honouring thrombolytics). In developed countries, however, where treatment conditions are better, mortality rates are even lower [2] [10].

Limitations: Small sample size and retrospective nature of our study.

5. Conclusion

Severe pulmonary embolism is a frequent medical emergency in our department. The majority of patients were over 50 years of age and predominantly female. There was a long delay in admitting patients to the department with the classic clinical signs of pulmonary embolism. Ultrasonographic signs of acute pulmonary embolism were present in all patients. Streptokinase was the only thrombolytic used. In-hospital mortality was high, reflecting the delay in management. Better organisation of care services and improved technical facilities are needed to improve patient prognosis.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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