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Research Article

Use of Streptokinase for intravenous thrombolysis in pulmonary embolism: Practice and results (Data from the pulmonary embolism registry of Bogodogo University Hospital Center in Burkina Faso (PER/UHC Bogodogo-BF)

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Abstract

Objective : The objective of this part of the registry was to evaluate the practices and results in terms of Streptokinase thrombolysis in pulmonary embolism.

Methods : patients included in the pulmonary embolism registry were subdivided into those who had received streptokinase and those who had not. Chi-square and Fisher Exact tests were used in univariate analysis to determine the categorical variables associated with thrombolysis. To assess the clinical efficacy of streptokinase, vital constants at admission (t0) and 1h post-thrombolysis (t1) of thrombolyzed patients were matched and compared using the wilcoxon signed-rank test. Mean echocardiographic parameters were compared at t0 (admission) and t1 (24 hours). A $p<0.05$ value defined the significance threshold for judging a difference not related to chance.

Results: The proportion of thrombolysed patients was 13.7%. Streptokinase was used in patients at high risk of early death. Vital clinical parameters (blood pressure, oxygen saturation, respiratory rate) were significantly improved at the end of perfusion. Right ventricular dysfunction parameters were significantly improved after Streptokinase treatment. The proportion of minor bleeding was significantly higher in the Streptokinase group (11.6% vs 6% OR=2.9).

Conclusion : Streptokinase is used to treat pulmonary embolism in patients who satisfy certain severity criteria. The result is a significant improvement in clinical and echocardiographic parameters, at the cost of an increased risk of minor bleeding.

Keywords: pulmonary embolism, high risk of early death, streptokinase

Introduction

Pulmonary embolism is defined as the sudden obstruction of the pulmonary artery or one of its branches by a clot, usually fibrinocruoric [1]. It ranks third among cardiovascular diseases in the world after ischemic heart disease and stroke [2]. Data from the literature show an increase in mortality in hospital series. This development is due to serious forms with a high risk of early death. Three essential factors can explain the occurrence of a pulmonary embolism with a high risk of death. It is; the size of the clot; right ventricular systolic function and the state of respiratory function. The stratification of this risk of early death is clearly stated in the European recommendations [3]. If the detection of these forms does not usually pose problems, their therapeutic management can be a challenge. Thrombolysis remains the ultimate therapy in cases of extreme emergency or inaccessibility to interventional embolectomy. This last means of treatment is not common to hospitals in Sub-Saharan Africa. Medicinal fibrinolysis now benefits from the addition of new thrombolytics which offer greater safety in use by reducing iatrogenic hemorrhagic complications. Their high cost limits their accessibility in Sub-Saharan Africa, hence the use of old molecules with a high risk of bleeding. The objective of this part of the registry was to evaluate the practices and results in terms of Streptokinase thrombolysis in pulmonary embolism.

2. Patients and Methods

2.1. Type, period and setting of the study

This is a prospective cohort with analytical purposes carried out from a single-center hospital register between March 1, 2017 and June 31, 2022. The cardiology department of the Bogodogo University Hospital Center (REP/UHC-B) was the framework of the study. It has 18 beds including 3 intensive care beds. The pyramidal organization of the 3-level health system makes this center a reference center, especially for emergencies and patients requiring admission to intensive care.

2.2. Inclusion criteria

The inclusion criteria were PE diagnosed on chest scann or presumed on cardiac ultrasound in forms with a high risk of early death in which hemodynamic instability or unavailability of the scanner required emergency reperfusion.

2.3. Study variables and operational definitions

The dependent variable of the study was the "thrombolysis" variable. The independent variables were data; clinics; biological; electro-echocardiographic; scannographic upon admission of patients. The risk of early death assessed by the PESI (Pulmonary Embolism Severity Index) score. It was judged high if the PESI score ≥3 or the simplified PESI score ≥1 [4]. Dilation of the right ventricle was defined by a ratio of right on left ventricular diameters measured in 4-cavity incidence ≥ 0.9 [5]. Right ventricular systolic dysfunction was defined as an excursion of the plane of the tricuspid annulus < 17 mm [5]. The progressive variables studied were death, the occurrence of hemorrhage or allergy after thrombolysis.

2.4. Data collection tools and methods

Data were collected upon patient admission. The search for syncope/lipothymia and other functional signs was carefully carried out by questioning the patient and those around him. An individual collection sheet served as a collection tool.

2.5. Data processing and analysis

The data were entered into Excel and analyzed using Stata software. The patients were subdivided into two groups depending on whether the dependent variable was found or not: Thrombolysis (+) vs Thrombolysis (-). The Khi2 and Fisher Exact tests were used in univariate analysis to determine the categorical variables associated with the realization of thrombolysis. For quantitative variables, Student average comparison test was used after checking normality. In the absence of normality of the variable, the Kruskal-Wallis test was used for a comparison of medians. The normality of the distribution of continuous variables was tested by graphical methods. A p value <0.05 defined the significance threshold for the association between the independent variables and syncope. All variables whose p-value in univariate analysis was < 0.2 were included in a model for multivariate logistic regression in order to determine the variables associated with the realization of thrombolysis.

The vital constants on admission (t0) and post-thrombolysis 1 hour later (t1) of thrombolyzed patients were matched and then compared using the Wilcoxon signed-rank test. The average of the echocardiographic parameters were compared at times t0 (admission) and t1 (at 24 hours). A p value <0.05 defined the significance threshold for judging a difference not linked to chance.

3. Results

3.1. General characteristics of the study population

During the study period (March 2017 to January 31, 2023), 2464 patients were hospitalized in the department, including 502 for PE, representing a prevalence of 20.37%. There were 269 women, representing 53.5%, and a sex ratio (M/F) of 0.86. The age of the patients ranged from 18 to 96 years with an average of 54 years +/- 16.8 years. Figure 1 shows the distribution of patients by age group. The modal class is that of [40; 50 years] with 112 patients representing 22.31%.

3.2. Prevalence of thrombolysis according to the level of risk of early death

The proportion of thrombolyzed patients was 13.7%. Figure 2 compares the proportions of thrombolyzed patients according to the level of risk of death assessed by the PESI score. The proportion of thrombolyzed patients ranged from 1.8% for PESI class 1 to 72.7% for PESI class 5. This involved intravenous thrombolysis in all cases on a peripheral venous route. The infusion regime was 2 hours in 92.7% (64 patients). In five patients, the infusion lasted 1h30. In these cases, these were patients with intracavitary thrombi at high embolic risk. The average dose of Streptokinase was 1.5 million international units.

3.3. Thromboembolic risk factors, functional and general clinical signs associated to the realization of thrombolysis

Tables 1 and 2 report the thromboembolic risk factors, functional and general signs associated to the realization of thrombolysis. Blood pressure collapse, tachycardia and syncope were the variables significantly associated to the realization of thrombolysis. No TERF was statistically associated to the realization of thrombolysis.

3.4. Electroechocardiographic variables associated to the realization of thrombolysis

Table 3 reports the univariate analysis of the electro-echocardiographic variables associated to the realization of thrombolysis.

3.5. Evolution of clinical and echocardiographic parameters in patients thrombolyzed with Streptokinase

Table 4 shows the evolution in thrombolyzed patients; clinical parameters before and one hour after thrombolysis; and ultrasound parameters 24 hours later. All clinical and echocardiographic parameters were significantly improved by the treatment.

3.6. Intra-hospital complications

Table 5 reports a comparison of complications in the 2 groups. Thrombolysis was significantly associated with the occurrence of minor hemorrhage (11.6% vs 6%; OR=2; p=0.05).

4. Discussion

The hospital prevalence of PE in the PER/CHU-B at the date of the analyzes was 20.51%. The proportion of thrombolyzed patients was 13.7%. The objective of our work was to report the practices and results in terms of Streptokinase thrombolysis in PE. Our results show that thrombolysis is performed almost exclusively in patients at high risk of early death. No thromboembolic risk factor was statistically associated to the realization of thrombolysis. The assessment of cardiovascular risk by the PESI score alone is not optimal. In fact, patients with a PESI score of 1 or 2 had been thrombolyzed. These are patients with right intracavitary thrombi whose hemodynamic state was stable. Indeed, several authors have also shown the limits of the PESI score in assessing the severity of PE [6,7]. An association of echocardiographic parameters with the PESI score showed a significant improvement in the prediction of PE severity with an AUC going from 0.76 to 0.86 [8]. Approximately 9.9% of patients are accurately reclassified.

Blood pressure collapse, tachycardia and syncope were the variables significantly associated to the realization of thrombolysis. In several studies the predictive value of syncope on the severity of PE was controversial [9–13]. In a more recent metaanalysis, syncope was associated with a high rate of death explained by more frequent hemodynamic instability [14]. The use of Streptokinase in our study therefore complies with the standards found in the literature.

The ultrasound profile of thrombolyzed patients shows severe right ventricular dysfunction parameters. The presence of right intracavitary

thrombi was the factor most associated to thrombolysis (10.4% vs 0.4%; OR=24.31). There are no guidelines for the management of pulmonary embolism with right intracavitary thrombi without collapse or shock [15]. The therapeutic resources available are unfractionated heparin, embolectomy, most often interventional, and thrombolysis. The latter seems to be the most judicious according to several studies [16–20]. The usefulness of thrombolytics in reducing mortality in severe forms and the recurrence of embolisms has been proven, however these treatments are associated with an increased risk of minor and major hemorrhages [21–24]. All clinical and echocardiographic parameters were significantly improved after Streptokinase infusion in our study. In addition, the risk of minor hemorrhage was multiplied by 2.2. In a recent metaanalysis, Li et al. showed that 4 thrombolytics (Streptokinase, Alteplase, Tenecteplase, urokinase) significantly reduced mortality compared to heparin alone [25]. Alteplase offered greater safety in terms of reducing the risk of bleeding. Financial accessibility to this molecule remains limited in Sub-Saharan Africa.

5. Conclusion

Our study shows that Streptokinase is used in pulmonary embolism in patients who present severity criteria. This results in a significant improvement in clinical and echocardiographic parameters at the cost of the increased risk of minor hemorrhage. The success of thrombolysis is conditioned by good patient selection and the choice of a good perfusion protocol.

Declaration of links of interests

This work is based on data from the pulmonary embolism registry of the Bogodogo University Hospital. The authors declare that they have no links of interest.

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