



Use of Vasopressive Amines in a Limited Resource Country

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Abstract

Introduction: Vasopressive amines are frequently used in cardiology. The aim of our work was to evaluate the practical modalities of use of amines in the cardiology department of University Hospital Yalgado Ouédraogo. **Patients and Methods:** We conducted a prospective observational study for 6 months, from 01 June to 31 November 2013, including all patients treated with vasopressive amines. We were interested in the different clinical pictures, the indications, the choice of amines, and the practical application of the treatment. **Results:** Fifty patients were included in the study; the mean age was 58 ± 17.6 . The sex ratio was 0.85. Hypertensive heart disease was the underlying cardiac disease in 34% of cases. A known chronic heart failure was observed in 62% of cases. Clinical admission tables were dominated by overall heart failure (74%). Vascular collapse (38%) and shock (36%) were the main indications of treatment. Severe alterations in left ventricular systolic function were found in 74% of cases. Dobutamine was the amine of choice (90%). The average time to start treatment was 96.32 minutes (range 15 - 660 minutes). The time to relay between syringes was more than ten minutes in 72% of the cases, and the nurses' unavailability was the main cause. Monitoring was manual in almost all cases. The average duration of treatment was 6.64 days. Treatment-related incidents were observed in 26% of cases. The intra-hospital mortality of patients with amines was 48%. **Conclusion:** The indications of vasopressive amines in the cardiology department are close to the international recommendations. But this treatment suffers in its practical application. The duration of treatment remains excessive but is explained by the lack of therapeutic alternative.

Subject Areas

Cardiology, Emergency & Critical Care

Keywords

Vasopressor Amines, Acute Cardiac Insufficiency, Cardiogenic Shock

1. Introduction

Vasopressor or sympathomimetic amines are substances capable of reproducing the effects of the natural catecholamines of the autonomic nervous system. They are one of the pillars of the treatment of acute heart failure. Their mainly cardio-vascular effects make it a valuable tool in cardiology [1].

The occurrence of acute heart failure is a turning point in the course of heart disease. It makes therapeutic decisions often urgent.

When the clinical picture shows signs of organ hypoperfusion, the use of vasopressant amines in the intensive care unit becomes imperative [2].

The objective of this work was to evaluate the practical use of vasopressive amines.

2. Patients and Methods

We carried out a prospective, monocentric study over a period of six months from June 1, 2013 to November 31, 2013. It involved the prescription and the use of vasopressive amines in the cardiology department of the Yalgado Ouedraogo Hospital.

Were included patients hospitalized in the cardiology department of CHUYO treated with vasopressive amines. The socio-demographic, clinical, and paraclinical characteristics as well as the treatment modalities were studied.

The analysis of therapeutic modalities covered indications, choice of amine, initial dosage, associated therapy, time between the prescription and its application, origin of the product, route of administration, type of duration of the interruption of infusion at the time of relays, but also the elements and means of surveillance, the criteria for the efficacy of the treatment, the methods of withdrawal and the duration of the treatment, as well as the fate of the patient.

An anonymous self-administered questionnaire was completed by paramedics to assess their knowledge of vasopressive amine therapy: indications, routes of administration, relay between the electric syringe pumps, monitoring of treatment.

We used the EPI INFO software in version 7.

Informed consent was received from every patients.

3. Results

During our study period 299 patients were hospitalized in our cardiology department. We collected 50 patients. The mean age of the patients was 58 ± 17.63

with extremes of 23 and 85 years. The age group of patients aged 60 - 69 years was the most represented (24%).

Hypertensive heart disease was the most common underlying disease 17 patients (34% of cases).

Acute heart failure was the major cause of admission with 31 patients (62%) of acute decompensation of known chronic heart failure.

Clinical admission scores were: overall cardiac decompensation in 37 patients (74%), cardiovascular collapse in 10 patients (20%) and shock in 9 patients (18%), left heart failure 5 patients (10%), and right heart failure 1 patient (2%). The mean ejection fraction of the left ventricle (LVEF) at entry was 35.45 ± 14.75 (extremes at 16% and 77%) (Table 1).

The indications were mainly dominated by cardiovascular collapse in 38% of cases (19 patients) and shock in 36% of cases (18 patients). Other indications were the worsening of congestive signs in 6 patients (12%), refractory cardiac decompensation in 4 patients (8%), oliguria in 3 patients (6%), decreased diuresis without oliguria in 3 patients (6%).

Twenty-eight patients (28) were placed under vasopressive amines upon admission.

The mean systolic blood pressure at prescription was $77.3 \text{ mmHg} \pm 21.2$ (range 0 - 110 mmHg). Seventy percent (70%) of the patients had a systolic blood pressure below 90 mmHg at the starting point of treatment. Dobutamine was prescribed, in 90% of cases, alone in 42% or in combination with Dopamine in 48% of cases. Dobutamine was initiated at a dose of $5 \text{ } \mu\text{g}/\text{kg}/\text{min}$ in 88.64% of cases. Dopamine was always started at a dose of $3 \text{ } \mu\text{g}/\text{kg}/\text{min}$.

Associating Dobutamine and Dopamine was prescribed in 53% of cardiogenic shock and in 47% of cardiovascular collapse. In the aggravation of the congestive signs, Dobutamine alone was used in 67% of the cases. In cardiac decompensation, Dobutamine-Dopamine was prescribed in half of the cases. Dopamine was prescribed in all cases of decreased diuresis and in all cases of oliguria.

Table 1. General patient characteristics.

Age	58 years \pm 17.63 (range 23 - 85 years)
Gender Male	46%
Chronic cardiac insufficiency	62%
Hypertensive heart disease	34%
LVEF:	
Between 30% - 40%	40%
<30%	34%
Admission	
Overall cardiac insufficiency	74%
Systolic blood pressure	$87.40 \text{ mmHg} \pm 26.5$ (0 - 140 mmHg)
Duration of hospitalization	$13.95 \text{ days} \pm 11.37$ (1 - 45 days)
Intra-hospital mortality	48%

Ace inhibitors (ACE inhibitors) or angiotensin II receptor agonists were associated with vasopressive amines in 40% of cases, digoxin in 16% of cases. Spiro-nolactone was not associated.

The mean delay between prescription and actual treatment was 96.32 minutes \pm 111.6 (range of 15 minutes and 660 minutes). In 46 patients, treatment was delayed. Unavailability of the product was the main cause. In half of the cases, the amines came from extra-hospital pharmacies.

Peripheral venous pathway was the main route of administration; the central pathway was less used, in two patients.

A single-way syringe was used in more than half of the cases (56%).

The relay between syringe- pushers observed in 43 patients was done in manual in all cases with a single syringe pump. There was no early preparation of the syringe. The mean duration of the interruption of the amine infusion during the syringe relay was 15 minutes, it exceeded 10 minutes in 72% of the patients and the nurses' unavailability was the main cause (**Table 2**).

Treatment monitoring was performed by manual monitoring of the constants in almost all patients.

The efficacy criterion was an increase in blood pressure in 46% of patients, a decrease in signs of heart failure in 41%, and an improvement in diuresis in 13% of patients.

Weaning was done in 23 patients by gradual digression of 0.1 cc/h, *i.e.* 0.2 γ /kg/min. However eight patients were weaned for lack of financial means and one patient for shortage of amine. Eighteen patients died before weaning.

Incidents were noticed: loss of venousroute, (31%), hemodynamic instability during relays (23%), hemodynamic instability after weaning (23%), hemodynamic instability at breakdown (15%), and power failure (8%).

Treatment-related complications were observed in 13 cases of tachyphylaxis in 61% of cases and ventricular extrasystolia in 38.5%.

The mean duration of treatment was 6.7 days \pm 6.64 with. The death rate was 48%. Eight patients died within 24 hours of initiation of treatment.

Among paramedics, 91% had never received practical training regarding the use of vasopressive amines. More than half (55%) were unaware of their indications, 64% were unaware of the monitoring elements, and almost all (91%) did not know that the needle relay should be immediate.

Table 2. Breakdown by relay interruption duration (N = 43).

Duration of interruption during relay	Frequency	Percentage
<5 min	12	27.91%
[10 - 15 min]	23	53.49%
[16 - 20 min]	2	4.65%
[21 - 30 min]	3	6.98%
>30 min	3	6.98%
Total	43	100%

4. Discussion

Biological patient monitoring was a limitation of our study. In the study's insufficiency we also found that the level of paramedics' knowledge that was not correlated with their seniority in the profession.

The mean age of the patients was 58 years \pm 17.63. The largest numbers were in the age groups 60 - 69 and 70 - 79. Our results are similar to those found in the French registers of 1990 where the average age was 65 years [3]. However, patients from the registers of the National Observatory of Acute Cardiac Insufficiency in France OFICA and American registries ADHERE and OPTIMIZED-HF from the early 2000 were older [3].

In our work, men were less numerous than women, as in the registers OFICA (45%) and ADHERE (48%) [4].

In our study, as in African data, the most common underlying cardiac disease was hypertensive heart disease, followed by dilated cardiomyopathy and valvular heart disease [5] [6] [7], while in Europe, ischemic heart disease remained the majority [3] [4].

Sixty-two percent (62%) of patients had known chronic heart failure prior to the episode of decompensation. This is what we can find in registers such as the US (ADHERE) and European (Euro-HF and EFICA), 65% to 75% of the same clinical situations [4].

The ICA clinical scenarios for admission to the service were dominated by overall heart failure (74%), close to the results of the OFICA registry (50% - 65%) [3].

We observed a severe impairment of left ventricular systolic function in 74% of patients, whereas in Europe the proportion of heart failure with preserved ejection fraction varied between 35% and 50% [3].

The degraded clinical picture of our patients is the result of an advanced myocardial deposition of late discovery, associated with nonobservance and recurrent ruptures of the treatment because of the precariousness of resources and the ignorance of the signs of severity of the disease.

In our study, the main indications of vasopressive amines were: cardiovascular collapse (38%), shock (30%). Three-quarters of the patients had a SAP less than 90 mmHg at the time of treatment initiation.

It is interesting to note in the literature that the administration of inotropic agents often does not follow indications or recommendations [1].

In the results of the French register EFICA, whereas the proportion of cardiogenic shock is around 5% - 8%, inotropic utilization rates are between 10% and 30%, suggesting a use beyond the usual recommended framework [3].

LOGEART reported an inotropic administration rate of 14.3% in the OFICA registry whereas only 7% of patients were in shock.

Among the patients in OPTIMIZE-HF study, 14% of patients were treated with an inotropic agent for systolic pressures between 120 mm Hg and over 160 mm Hg. In the ADHÈRE experiment, only 8% of all patients receiving inotropes

had a systolic blood pressure < 90 mmHg. Data from the Euro-HF II experiment indicate that more than 4% of patients with hypertensive heart failure (with HTA defined as 180/100 mmHg) received dobutamine or dopamine [1].

Although the place of vasopressive amines is indisputable in shock states and severe hypoperfusion situations, they are also used in situations of acute cardiac decompensation and in the tables of persistent hemodynamic failure despite optimal medical treatment [8].

The American College of Cardiology (ACCF) and the American Heart Association (AHA) recommend the use of inotropic agents including vasopressive amines for patients with acute heart failure with signs of low cardiac output with visceral pain, left ventricular systolic dysfunction and systolic blood pressure < 90 mmHg [9].

For the European Society of Cardiology (ESC), vasopressive amines were indicated for pressure values < 100 mmHg in the 2008 recommendations [10], and < 85 mmHg in the 2012 recommendations [11].

Dobutamine is the most frequently used molecule in heart failure and cardiogenic shock [12] [13] [14]. It is often used alone, but may be associated with other catecholamines, especially dopamine or adrenaline.

Dopexamine may be an alternative to dobutamine in the treatment of cardiogenic shock [14]. However, it is not available in our countries.

The average time to start treatment was 96.32 minutes. Immediate unavailability of amines and the lack of electrically driven syringes were the main causes.

The duration of the interruption between two syringe pushes exceeded 10 minutes in $\frac{3}{4}$ of the patients. This was due to unavailability of nurses (48%), unavailability of the product (22.6%) or unjustified (22.6%).

In our series we observed in 23% of cases a hemodynamic instability during the relays. In Europe, in the resuscitation services, different ways of carrying out these relays have been studied, with a view to shortening the duration of interruption as much as possible: the simple manual relay called “clic-clac” method, the double manual relay and the automated smart pumps relay [15].

Some French and Italian teams find the click-clac technique with two syringes more effective, because it considerably reduces the nursing time necessary to carry out the relay without difference in hemodynamic terms and with a good cost/benefit ratio [16].

REGAD *et al.* concluded that automated relays allow better organization of nursing work and save time, while limiting the risk of hemodynamic instability associated with this procedure [15].

ARGAUD *et al.* compared the relay with the click-clac technique with two syringes before and after a practical training of the nurses and they were satisfied with it in terms of hemodynamic tolerance [16].

The choice of relay techniques has not been the subject of consensus in the literature. However, the click-clack technique is simpler, faster, more efficient and less expensive. This method is all the more effective in that it is accompanied by a good training of nurses.

In our study we recorded an average duration of treatment of 6.7 days \pm 6.64 although we know there is a phenomenon of down-regulation of β receptors in 24 - 72 hours [14].

With the picture of cardiac refractory heart failure presented by the majority of patients in our study, vasopressive amines should only be a bridge to other modern therapeutic means (resynchronization, mechanical circulatory assistance, cardiac transplantation) that are not feasible in our context.

We recorded 48% of deaths and 6% of re-hospitalizations. This intra-hospital mortality remains much higher than in European data on acute heart failure, particularly in France with 8.2% in the OFICA observatory, 12% in the 2009 English audit and 6.5% in the Italian register IN-HF; the rate of death and re-hospitalization is still lower in the United States: 4% in the ADHERE register [3] [4].

TACON concluded that the use of dobutamine was not associated with improved mortality [17].

For GHEORGHIADÉ *et al.* in a multicenter American and European study of management of hospitalized patients with heart failure with low blood pressure, had found that these patients had much higher intra-hospital mortality, as well as a re-hospitalization and death rate higher than that of the general population of cardiac insufficiency [18].

The clinical characteristics of our patients, the prolonged administration of vasopressive amines in these patients due to a lack of therapeutic alternatives, are all factors that can explain the high death rate encountered in our work. The precariousness of resources is also an additive factor.

At the nursing level, 91% had never received practical training in the use of vasopressive amines (VAS), 55% were unaware of their indications, 64% were unaware of the monitoring elements, 91% did not know that the relay between two syringes should be immediate.

This underperformance of the paramedical staff is a problem for the use of vasopressive amines in our context.

5. Conclusions

The use of vasopressive amines in cardiology has been widely recognized for many years in particular for the management of acute heart failure syndrome.

The practical modalities of initiating this treatment in our context encounter difficulties in relation to the qualified material and human resources.

Good medical and paramedical training is essential, accompanied by the drafting of specific therapeutic protocols, validated, applied and re-evaluated regularly.

Conflicts of Interest

Authors do not report conflicts of interest.

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