Occurrence Rate and Clinical Predictors of Hypertensive Pseudocrisis in Emergency Room Care

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Summary

Objectives: To describe the prevalence of hypertensive pseudocrisis in patients treated in emergency rooms with substantially elevated blood pressure levels. To compare this prevalence in private and public hospitals. To describe the frequency of wrong treatment for this condition. To identify, during triage, independent predictors of pseudocrisis. To evaluate the prognosis of patients with pseudocrisis.

Methods: Patients above the age of 18, admitted to the Emergency Rooms of two hospitals (private and public) during a 6 month timeframe, with diastolic blood pressure ≥ 120 mmHg were included in the study. Hypertensive pseudocrisis was determined when none of the criteria for hypertensive crisis were present (Guidelines of the Brazilian Society of Cardiology[1]).

Results: In the 110 patients studied, the prevalence of hypertensive pseudocrisis was 48% (95% CI = 39%-58%) and prevailed in the private hospital (59% *vs* 37%, p=0.02). The frequency of wrong treatment was similar between the two hospitals (94% *vs* 95%, p=0.87). After multivariate analysis, the presence of headache upon admission (Odds Ratio=5.4; 95% CI = 5.1-13; p< 0.001) and diastolic BP levels (Odds Ratio=0.93; 95% CI = 0.89-0.97; p=0.002) were independent predictors of pseudocrisis. The 5 month mortality rate was lower in the pseudocrisis group than the hypertensive crisis group (0% *vs* 21%, p=0.0004).

Conclusions: There is a high prevalence of hypertensive pseudocrisis in patients when hypertensive crisis is suspected, particularly in the private hospital. The frequency of wrong treatment was similar for both the private and public hospitals. Headaches and diastolic BP levels are independent predictors for this clinical condition. Hypertensive pseudocrisis has a low rate of lethality.

Key words: Hypertension, prevalence, predictors; emergency medical services.

Introduction

Hypertensive pseudocrisis is defined as the accentuated elevation of blood pressure, with no risk of acute target organ deterioration[1,2] . This condition is referred to as pseudocrisis since it is usually confused with hypertensive crisis, a condition that presents potential risk or evidence of acute target organ lesions or imminent risk of death[3]. Since it is a low risk condition there is no indication for aggressive blood pressure lowering with anti-hypertensive medications and in fact this treatment could cause ischemia due to the abrupt drop in blood pressure[4,5].

Even though this appears to be a frequent condition in emergency rooms, medical literature contains no data regarding the prevalence, clinical characteristics of the patients or therapy methods. The first step for the emergency team during triage is to classify the patient based on the seriousness of the condition and necessity for treatment. At this time an inadequate definition could lead to a sequence of equivocal reasoning. For this reason it is important to define from the beginning, whether or not the clinical picture of these individuals is actually related to increased blood pressure levels. Nevertheless, medical literature does not contain any data in regard to predictors for hypertensive pseudocrisis.

The objectives of this study are: 1) To describe the prevalence of hypertensive pseudocrisis in patients treated in emergency rooms that present diastolic blood pressure ≥ 120 mmHg; 2) To verify whether or not there is a difference in the prevalence of pseudocrisis between private and public hospitals services; 3) To describe the occurrence of wrong pseudocrisis treatment, comparing the care offered at the private and public hospitals; 4) To identify the clinical characteristics found during triage that offer higher diagnostic probability to identify this clinical condition; 5) And lastly, to compare, by means of prospective follow-up, the survival rates of the groups of patients with hypertensive crisis and pseudocrisis, in order to confirm the more benign character of the pseudocrisis.

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Methods

Between February and August 2005, symptomatic patients over the age of 18, admitted to an emergency room with diastolic blood pressure (BP) ≥ 120 mmHg were included in the study. The study was conducted in two hospitals: Hospital da Cidade (HC – City Hospital) and Hospital Geral do Estado (HGE – General State Hospital), representing private and public institutions, respectively. Medical histories of the patients were taken and they were submitted to a physical examination including fundoscopy (Ophthalmologist). Two blood pressure measurements were taken with a one minute interval and the higher reading was discarded[6]. The readings were taken with a calibrated aneroid device using previously established methods[7]. The researchers did not intervene in the therapeutic treatment which was conducted in accordance with the criteria of the medical teams at each hospital. The study was approved by the Research Ethics Committee of the Bahiana Foundation for Science Development and the patients included in the study signed a Free and Informed Consent Form.

Hypertensive pseudocrisis was determined when none of the following conditions were present: hypertensive encephalopathy, ischemic stroke (IS), hemorrhagic stroke (HS), subarachnoid hemorrhage, transient ischemic attack (TIA), malignant hypertension, cranioencephalic trauma, acute aortic dissection, acute coronary syndrome, heart failure, acute pulmonary edema, acute glomerulonephritis, vasculitis and severe epistaxis[3]. The presence of one of these conditions determined the diagnosis of hypertensive crisis. These patients were submitted, upon admission, to the following complementary tests: chest x-ray, electrocardiogram, complete blood count, creatinine and urinalysis. Echocardiography and computerized tomography scans were performed on the patients when indicated, based on the suspected diagnosis (aortic dissecting aneurysm, hypertensive encephalopathy, ischemic or hemorrhagic stroke, subarachnoid hemorrhage, transient ischemic attack and cranioencephalic trauma). Wrong treatment was defined when anti-hypertensive medications were administered to the pseudocrisis patient to immediately lower blood pressure.

Clinical variables were obtained during triage through interviews and physical examinations, for testing as predictors of hypertensive pseudocrisis. To record lethality, patient follow-up was conducted for a minimum timeframe of 3 months. Hospital follow-up was performed by the research team and after discharge the patients were contacted by telephone.

Prevalence rates were expressed as percentages with a 95% confidence interval and were compared using the chi-square test. Comparison of the clinical characteristics between the pseudocrisis patients and the hypertensive crisis patients was conducted using the chi-square test for categorical variables and the Student's t-test for continuous variables. The Mann-Whitney test was used to compare continuous variables with no irregular distributions ("diastolic BP", that presented a high concentration of 120 mmHg readings, the minimum level required to be included in the study). Significant independent variables in the univariate analysis were included in the multivariate logistic regression model. The Receiver Operator Characteristics (ROC) curve was used to evaluate continuous variables that were found to be independent predictors during multivariate analysis, which suggested the ideal cut-off point to predict the presence of hypertensive pseudocrisis. Comparison of survival rates for the patients with pseudocrisis and hypertensive crisis was conducted using the Kaplan Meier curve and Log Rank test. Statistical analysis was performed using the computer program SPSS, version 10.0. Statistical significance was pre-established as $p < 0.05$.

Results

One hundred and thirteen patients were selected, of which 3 refused to participate in the study. Therefore, 110 patients were evaluated, age 58 ± 15 years, 64% females, 56 patients (51%) in the private hospital and 54 (49%) in the public hospital. The prevalence of pseudocrisis among these patients was 48% (95% CI = 39% - 58%). It was higher in the private hospital when compared to the public hospital (59% *vs* 37%, p = 0.02). Among the patients with the diagnostic criteria for pseudocrisis, 50 (94%) received wrong treatment (anti-hypertensive). This phenomenon was similar for both the private and public hospitals (94% *vs* 95%, p = 0.87, respectively).

In relation to the predictor variables analyzed, patients with hypertensive pseudocrisis were predominately white (36% *vs* 19%, p < 0.04), presented headaches as the primary complaint (60% *vs* 19%, p < 0.001) and had lower systolic (196 ± 23 *vs* 214 ± 30 mmHg, p = 0.001) and diastolic blood pressure levels (124 ± 6 *vs* 137 ± 21 mmHg, p < 0.001), when compared to the patients with hypertensive crisis. The remaining characteristics were similar for the two groups (Table 1). In relation to prior medical history, pseudocrisis had a lower association with coronary artery disease (0% *vs* 12%, p = 0.008) and heart failure (0% *vs* 8.8%, p = 0.03) (Table 2). Significant variables from the univariate analysis were evaluated as a group in multivariate logistic regression analysis, where only headaches (OR = 5.4; 95% CI = 5.1 – 13; p < 0.001) and diastolic blood pressure (OR = 0.93; 95% CI = 0.89 – 0.97; p = 0.002) were found to be significant independent predictors of pseudocrisis (Table 3).

The median diastolic blood pressure was 130 mmHg in the hypertensive crisis group compared to 120 mmHg in the hypertensive pseudocrisis group (p < 0.001) (Figure 1). For the diagnosis of pseudocrisis, diastolic blood pressure levels presented a significant area below the ROC curve (0.71; 95% CI = 0.61 – 0.80) (Figure 2). In this analysis the most accurate cut-off point was 121 mmHg, obtaining sensitivity of 64% and specificity of 68%. Therefore, patients with diastolic BP below 121 mmHg presented a 65% chance of pseudocrisis compared to 33% of the patients with diastolic BP ≥ 121 mmHg (p = 0.001).

The follow-up timeframe was similar for the pseudocrisis and hypertensive crisis groups (157 ± 39 days *vs* 161 ± 49 days; p = 0.65, respectively) and we lost contact with 4 patients (03 with hypertensive crisis). All the pseudocrisis patients are still alive while 12 of the hypertensive crisis patients have died, which is equal to a lethality rate of 21% (p = 0.0004) (Figure 3). These patients presented higher blood pressure levels (systolic and diastolic BP) in relation to those

Table 1 - Clinical and Demographic Characteristics of the individuals with pseudocrisis and hypertensive crisis

Variable analyzed	Hypertensive pseudocrisis (n = 53)	Hypertensive crisis (n = 57)	p value
Age (years)	57 ± 15	58 ± 15	0.60
Male gender	22 (42%)	18 (32%)	0.28
White race*	19 (36%)	11 (19%)	0.045
Illiterates	6 (11%)	8 (14%)	0.67
Main complaint			
Headache	32 (60%)	11 (19%)	< 0.001
Overall discomfort	4 (7.5%)	3 (5.3%)	0.62
Vertigo	6 (11%)	2 (3.5%)	0.12
Chest pain	6 (7%)	4 (11%)	0.42
Dyspnea	3 (5.7%)	7 (12%)	0.23
Systemic blood pressure			
Sistolic	196 ± 23	214 ± 30	0.001
Diastolic	124 ± 6	137 ± 21	< 0.001

**The variable race was defined as "white" and "non-white".*

Table 2 - Prior clinical conditions of the individuals with pseudocrisis and hypertensive crisis

Variable analyzed	Hypertensive pseudocrisis (n = 53)	Hypertensive crisis (n = 57)	p value
Hypertension	47 (89%)	55 (97%)	0.12
Anti-hypertensives	12 (23%)	9 (16%)	0.36
Diabetes	8 (15%)	15 (26%)	0.15
Dyslipidemia	18 (34%)	16 (28%)	0.50
Smoking	14 (26%)	25 (44%)	0.06
CAD	0 (0%)	7 (12%)	0.008
CHF	0 (0%)	5 (8.8%)	0.03

n - número de pacientes; CAD - coronary artery disease; CHF - congestive heart failure.

Table 3 - "Logistic Regression" of the predictable variables of hypertensive pseudocrisis

Predictable variable	p value		Odds ratio	95% CI
	Initial model	Final model		
White race	0.83			
Headache	0.01	< 0.001	5.4	2.1-13
Prior CAD	0.81			
Prior CHF	0.83			
SBP	0.45			
DBP	0.005	0.002	0.93	0.89-0.97

CI - confidence interval; CAD - coronary artery disease; CHF - congestive heart failure; SBP - sistolic blood pressure; DBP - diastolic blood pressure.

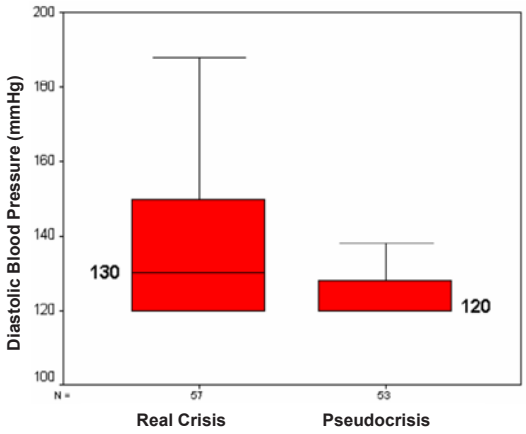

Fig. 1 - "Box Plot" of the median diastolic blood pressures for hypertensive crisis and pseudocrisis.

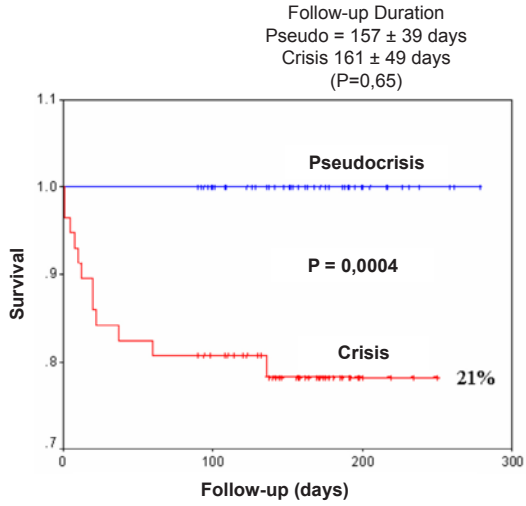

Fig. 3 - Survival Curve (Kaplan Meier) of the individuals with hypertensive crisis and pseudocrisis.

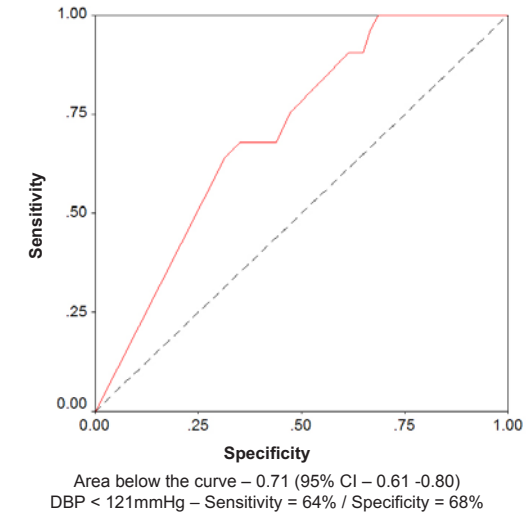

Fig. 2 - "ROC Curve" of diastolic BP as a predictor of hypertensive pseudocrisis.

with pseudocrisis, as well as a higher rate of acute lesions on hypertension target organs. Also in relation to deaths, 8 (66%) were caused by stroke; 2 (17%) hypertensive encephalopathy; 1 acute aortic dissection and 1 acute myocardial infarction. In-hospital deaths accounted for 75% of the total and the others occurred after hospital discharge. Nine (75%) of the 12 deaths occurred in the public hospital.

Discussion

The present study demonstrates a high prevalence of hypertensive pseudocrisis in patients admitted to emergency rooms with symptoms attributed to increased blood pressure levels, which was more evident in the private hospital than the public hospital. In both scenarios, most of the pseudocrisis patients received wrong anti-hypertensive treatment, given as if they had a real hypertensive crisis. Among the various clinical characteristics evaluated during triage, headaches and diastolic BP levels were identified as independent predictors for hypertensive pseudocrisis. Lastly, confirming the benign character of this clinical condition, there were no deaths during the follow-up of these patients, whereas individuals with hypertensive crisis presented high lethality during the average 5 month follow-up timeframe.

There is very little medical literature data on hypertensive pseudocrisis and this is the first Brazilian study to describe in detail the frequency of this condition in distinct emergency rooms. In addition, our description also covers the interpretation and treatment of this common clinical condition by the on-duty emergency room doctor. The necessity to eliminate this condition has been indicated in reports on hypertensive crisis[2,3,8]. It is possible that the high occurrence of hypertensive pseudocrisis is due to the fact that the population attributes unspecific symptoms to increased blood pressure levels when more often than not the blood pressure elevation is a consequence of these symptoms. The higher prevalence in the private hospital could be due to the fact that these patients have ready access to medical care. Therefore, these patients seek treatment for less intense and unspecified symptoms whereas public hospital patients with similar symptoms will delay treatment due to the difficulty to obtain emergency room treatment.

Almost all of the pseudocrisis patients were treated as if they had had a real crisis. In agreement with our data, Gus and associates[9] demonstrated that high BP, even in cardiology emergency services, was treated in 76.3% of the cases, whereas only 7.5% of the patients were classified as having hypertensive urgency or emergency. In our study, the frequency of wrong treatment for hypertensive pseudocrisis was elevated and similar in the private and public hospitals. In addition to being original, this finding reflects the similar behavior among the doctors of both hospitals and suggests that widespread action

for continuous education is needed in order to minimize the potential negative consequences of inadequate treatment. Cases have been reported of cerebral infarction[5,10] and myocardial infarction[11] with the use of nifedipine, myocardial ischemia with the use of diazoxide[12] and cerebral infarction with the use of clonidine.[13] All of these complications occurred after an acute drop in BP. These data indicate that an abrupt and inadequate drop in BP could transform a pseudocrisis into a real crisis, as a result of an ischemic event in a critical organ. Therefore, the isolated increase of BP, without a clinical picture of hypertensive urgency or emergency, rarely requires specific treatment[14,15]. On the other hand, considering the favorable evolution of the pseudocrisis patients in our study, events as a result of anti-hypertensive measures appear to be rare.

The high prevalence of hypertensive pseudocrisis and the elevated rate of inadequate treatment found in this study indicate the necessity for better knowledge of this condition in clinical practice. In order to improve this knowledge base, we researched characteristics that identify these patients during triage. Headaches, as the primary complaint, were independently associated with hypertensive pseudocrisis. In this regard, Nobre and associates[16] found that 88% of the patients who complained of a headache were wrongly diagnosed with hypertensive crisis, and Lima and associates[17] obtained better results using analgesics in comparison to anti-hypertensive medications for the clinical picture of "hypertension and headache" in the emergency room. Other publications have been trying to disassociate the headache as a secondary effect of the elevation in BP[18,19]. This could reflect the end of a myth: the headache as a consequence of the elevation in blood pressure. On the other hand, in a significant portion of patients this symptom appears to be the cause of the elevated BP, offering a new focus on initial treatment for hypertensive patients with this complaint that seek urgent care. In relation to blood pressure levels, we observed that the lower the diastolic BP is, the higher the chance of a pseudocrisis, which was an independent predictor in multivariate analysis. In accordance with these data, Varon and associates[20] indicated that target organ dysfunction, with some exceptions, is unusual with diastolic BP levels below 130 mmHg. Martin and associates[8] found higher diastolic BP level in patients with hypertensive emergency when compared to those with hypertensive urgency. Therefore, our study suggests that an observation during triage of a headache as the primary complaint and lower levels of diastolic BP, increases the probability that it is a pseudocrisis rather than a hypertensive crisis.

To confirm the benign character of the pseudocrisis in comparison to a real crisis, we conducted a 5 month follow-up on the patients with both clinical conditions. All the deaths occurred in the group of patients with hypertensive crisis. Most of the deaths were a result of neurological complications, which agrees with the findings of studies on hypertensive emergency complications[8]. On the other hand, data in literature[2-4] and practical results from studies on the use of pharmaceuticals to treat elevated BP symptoms in the emergency room[17], indicate these medications as the therapy of choice for hypertensive pseudocrisis situations. Therefore, patients with this clinical condition should be assessed with utmost caution before anti-hypertensive therapy is administered; the initial symptoms (emotion, pain, discomfort, epistaxis, etc) should be treated and controlled, since they should be considered as the cause and not the consequence of the elevated blood pressure levels, particularly when there is no risk of acute target organ lesions.

Considerations regarding the limitations of our study should be noted: 1) Our findings are only applicable for patients with diastolic BP equal to or higher than 120 mmHg, a fact that underestimates the prevalence of pseudocrisis in emergency rooms. Nevertheless, we chose this cut-off point, since most diagnostic confusion between pseudocrisis and hypertensive crisis occurs in this blood pressure range; 2) Even though our sample was not realistic, the patients were included consecutively to eliminate intentional selection; 3) Aneroid BP measuring devices were used that are not as precise as the validated digital devices. Nevertheless, special attention was given to the calibration of the devices and the blood pressure measurement methods[7]; 4) The favorable character of the pseudocrisis was probably overestimated, since we did not research minor or immediate adverse effects of the anti-hypertensive therapy on these patients (discomfort, vertigo, orthostatic hypotension, etc) and only evaluated the "lethality" outcome.

The present study is the first to describe the prevalence of hypertensive pseudocrisis in Brazil, address the clinical aspects that predict this condition, confirm the occurrence of wrong treatment and determine its prognosis. We believe that a more extensive practical knowledge of pseudocrisis - a prevalent clinical condition - will aid doctors in general and lead to adequate treatments that avoid the risk of iatrogenesis, unnecessary costs, stress factors and unwarranted prolonged stays in emergency rooms for the patients.

We conclude that there is a high prevalence of hypertensive pseudocrisis in emergency care in addition to having identified symptoms of headaches and diastolic blood pressure as independent predictors of this clinical condition. Also, its prevalence was higher in the private hospital than the public hospital and the wrong treatment was similar in both hospitals. Lastly we conclude that pseudocrisis is a clinical condition that has a good prognosis.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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