

Impact of Infarct Size on Blood Pressure in Young Patients with Acute Stroke

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Abstract

Background—Hypertension can be found in up to 80% of patients with acute stroke. Many factors have been related to this phenomenon such as age, history of hypertension, and stroke severity. The aim of our study was to determine the relationship between infarct volume and blood pressure, at admission, in young patients with acute ischemic stroke.

Materials and Methods—Patients younger than 55 years old admitted within 24 hours of ischemic stroke were included. Socio-demographic variables, systolic blood pressure, diastolic blood pressure, and infarct volume at admission were assessed. Statistical analysis: mean and SEM for quantitative variables, percentages for qualitative, and Spearman correlations (p value < 0.05 was considered statistically significant).

Results—Twenty-two patients (12 men), mean age: 44.64 ± 1.62 years. The most frequent vascular risk factors were: hypertension, smoking, and overweight (40.9%). Mean systolic and diastolic blood pressure on admission were: 143.27 ± 6.57 mmHg and 85.14 ± 3.62 mmHg, respectively. Infarct volume: 11.55 ± 4.74 ml. Spearman correlations: systolic blood pressure and infarct volume: $p = 0.15$ $r = -0.317$; diastolic blood pressure and infarct volume: $p = 0.738$ $r = -0.76$.

Conclusion—In our series of young patients with acute ischemic stroke, large infarct volume was not associated with high blood pressure at admission.

Keywords

Acute ischemic stroke; infarction; hypertension; blood pressure; young patients

INTRODUCTION

Hypertension is present in up to 80% of patients with acute stroke on admission. During the following days, blood pressure tends to decline. Most of the studies that assessed fluctuations of blood pressure in the acute phase of stroke have been performed in elderly populations. In some of these patients, the acute hypertensive response is secondary to untreated or undetected chronic hypertension; however, spontaneous reduction of the initial blood pressure over the following hours supports the role of other transient and stroke-specific mechanisms still not fully elucidated [1–5].

Age, transient autonomic dysfunction, and stroke severity have been related to this phenomenon. Nevertheless, information regarding the relationship between stroke severity and blood pressure at admission has shown contradictory results [6–11].

Likewise, young patients have different stroke pathogenesis and risk factors than those in the elderly. These patients, as we have recently described, should be a useful model for understanding the natural evolution of blood pressure in acute ischemic stroke because they

have less vascular risk factors and other medical conditions that could alter the autonomic system function and therefore, modify blood pressure [12].

The aim of our study was to evaluate the relationship between infarct volume and blood pressure at admission in a population of young stroke patients.

MATERIALS AND METHODS

We performed a substudy of the Argentinean Initiative for the Study of Young patients with Stroke and Fabry disease in our center. The protocol was approved by our institutional review committee and all patients gave their informed consent [12,13]. We included all patients between 18 and 55 years old who had been admitted for an ischemic stroke within 24 hours and had a brain MRI during hospitalization. An observer blinded to blood pressure values assessed infarct volume in DWI sequence. We analyzed the following: socio-demographic variables, vascular risk factors, stroke subtype, and systolic and diastolic blood pressure at admission. Statistical analysis: mean and SEM for quantitative variables, percentages for qualitative, and Spearman method for correlations. A two-tailed value of $p < 0.05$ was considered to be statistically significant.

RESULTS

Twenty-two patients (12 men) were included. Age: 44.64 ± 1.62 years; vascular risk factors: nine (40.9%) had hypertension, nine (40.9%) had smoking habits, nine (40.9%) were overweight, five (22.72%) were with dyslipidemia, three (13.63%) have diabetes, three (13.63%) were with previous stroke/TIA and two (9.09%) were with previous myocardial infarction. TOAST classification: one (4.54%) was secondary to large artery atherosclerosis, three (13.63%) were with cardioembolism, four (18.18%) were with small vessel occlusion, seven (31.81%) were with other determined etiology and seven (31.81%) were undetermined. NIHSS at admission: 5.36 ± 1.08 , systolic blood pressure: 143.27 ± 6.57 mmHg, diastolic blood pressure: 85.14 ± 3.62 mmHg, infarct volume: 11.55 ± 4.74 ml. Spearman correlations: systolic blood pressure and infarct volume: $p = 0.151$ $r = -0.317$ (Figure 1); diastolic blood pressure and infarct volume: $p = 0.738$ $r = -0.76$ (Figure 2).

DISCUSSION

Few studies have evaluated the evolution of blood pressure in young patients with stroke and their related

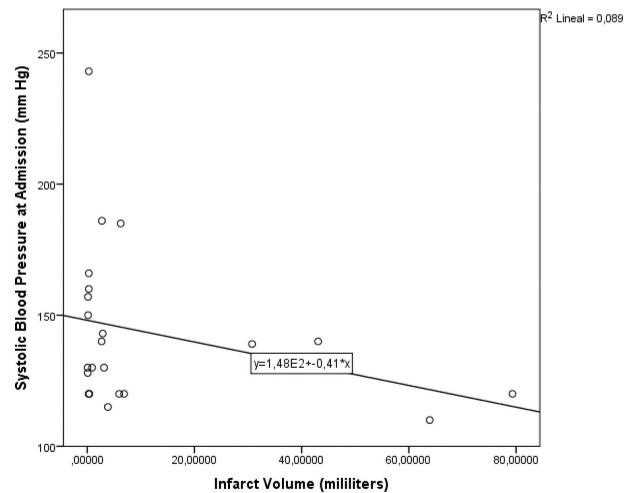


Figure 1. Systolic blood pressure and infarct volume correlation.

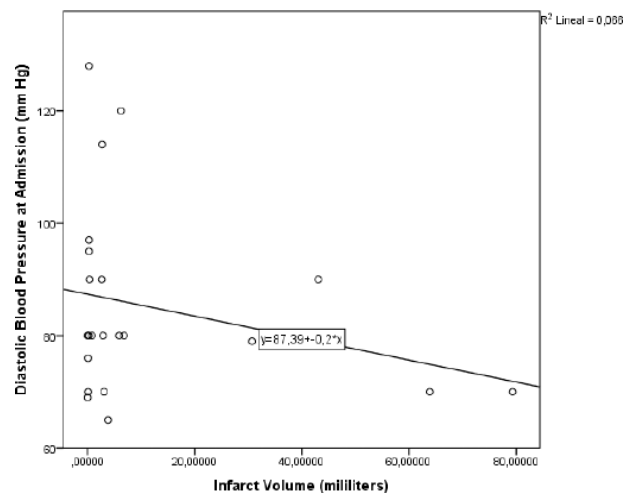


Figure 2. Diastolic blood pressure and infarct volume correlation.

mechanisms. Our results showed that large infarct volume was not related to high blood pressure values at admission. By the contrary, larger infarct volume was associated with lower blood pressure at admission even though it was not statically significant. Similarly, other studies that have evaluated the underlying mechanisms of hypertension in acute ischemic stroke did not find any relationship between stroke severity and blood pressure at admission [6,7]. Sykora *et al.* [8], in a cohort of 55 patients with cerebral ischemia (mean age: 58 years), reported that both NIHSS and infarct volume had no correlation with blood pressure at admission. They postulated that injury of specific brain regions and not

the stroke severity may be responsible for blood pressure changes during acute ischemic stroke. Christensen *et al.* [9] evaluated the course of blood pressure in acute stroke and its relationship with stroke severity in older patients and found that a drop in blood pressure during the first four hours after admission was associated with mild strokes, whereas maintained high blood pressure was related to severe strokes. Patients with mild to moderate stroke tend to have higher blood pressure at admissions that tend to decrease within the first hours [9]. Vemmos *et al.* [10], found in an elderly cohort that stroke severity correlated with higher blood pressure during the first 24 hours in all ischemic subgroups with the exception of lacunar strokes. Nevertheless, Jørgensen *et al.* [11] in a larger study including 1345 patients showed that blood pressure in acute unselected stroke patients was neither related to initial stroke severity nor to lesion size.

Many studies that evaluated the acute hypertensive response in stroke included older populations, patients with transient ischemic attacks and/or cerebral hemorrhages, and in many of them, the time from symptom onset to the first blood pressure measure was beyond the first 24 hours [2–5]. Young patients should be a useful model for understanding the natural evolution of blood pressure during acute stroke because they have less vascular risk factors or other conditions that could alter the autonomic function. Blood pressure in young patients drops during the subsequent hours of stroke onset despite initial blood pressure values at admission or the presence of different comorbidities, suggesting that other factors such as transitory autonomic dysfunction could be responsible of elevated blood pressure on admission in acute ischemic stroke [8,12].

We conclude that large infarct volume might not be responsible for acute hypertension in young patients with acute ischemic stroke. Knowing about the underlying

causes of the acute hypertensive response could contribute to the development of strategies for appropriate management of these patients. Further studies with larger number of patients are needed to support our findings.

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