Original Article

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Blood pressure is related to hemorrhagic stroke in patients with syncope episodes

Tadashi Kaneko, Kazumi Kumagai, Chiyomi Oshima, Takeshi Inoue

Abstract

***Study objective*: The indications for head computed tomography (CT) in the management of patients with syncope are unclear. In this study, clinical data from syncope patients were analyzed to identify the factors related to positive CT findings (hemorrhagic stroke).**

***Methods*: This study was a retrospective, single-medical-center analysis, conducted in the emergency department of a community hospital. Ninety-seven patients with syncope were included. Their clinical data were collected from their medical records. A logistic regression analysis was used to examine the positive head CT results.**

***Results*: Of these patients, 5% showed hemorrhagic stroke on CT. Diastolic blood pressure was significantly related factor to positive head CT (p=0.010).**

***Conclusions*: Diastolic blood pressure might be a factor indicating the need for head CT in syncope patients. A large prospective cohort study of the head CT protocol is required to confirm this result.**

Key words: Head computed tomography, hypertension, diabetes mellitus, heart disease.

Introduction

A consensus on the need for head computed tomography (CT) in patients after syncope episodes has not been established. Consciousness disturbance is one of the indications for head CT, but there is no established indication for head CT in patients with Glasgow Coma Scale (GCS) scores of 14-15. However, hemorrhage stroke has been reported to occur in about 5% of patients with syncope. (1)

In this study, we assessed the risk factors for hemorrhagic stroke in patients after a syncope episode and their need for head CT, based on their past histories and primary physiological findings.

Methods

Subjects

The study was designed as a single-center, retrospective, clinical study. The protocol was approved by the Institutional Review Board of Kanmon Medical Center. Patients were selected with the inclusion criteria: syncope episode, admission by ambulance, and a Glasgow outcome score of 14-15 on admission. One hundred twenty sequential patients who had been admitted between May 2008 and June 2009 were included. However, 23 patients were ineligible for the study because of a deficit in their clinical records. Ultimately, 97 patients were included in the study, all of whom had been

From Emergency and Critical Care Center, Kanmon Medical Center, Shimonoseki, Japan (Tadashi Kaneko, Kazumi Kumagai, Chiyomi Oshima, Takeshi Inoue)

Address for correspondence:
Tadashi Kaneko
Emergency and Critical Care Center
Kanmon Medical Center
1-1 Chofu-sotoura, Shimonoseki, Yamaguchi, Japan
Tel: +81-83-241-1199
Fax: +81-83-241-1301
E-mail: kaneyui-ygc@umin.ac.jp

examined with a head computed tomography (CT) scan.

Measurements

In this study, we collected each patient's data from their clinical records. The patient data included age, sex, vital signs on admission (systolic and diastolic blood pressure, heart rate, and body temperature), past history (hypertension, diabetes mellitus, heart disease, and stroke), and CT findings (hemorrhagic stroke was treated as positive).

Statistical analysis

The statistical analysis was performed using the statistical software program SPSS, version 16.0 (SPSS Inc., Chicago, IL, USA). A multivariate logistic regression analysis was performed with a stepwise procedure to identify the statistically meaningful predictive factors. The threshold for significance was set at $p<0.05$.

Results

Characteristics of patients with a syncope episode

The clinical characteristics of the 97 patients are listed in **Table 1**. The mean age was 67.6 years; 53 were men and 44 women. The mean systolic and diastolic blood pressures were 130 and 73.1 mmHg, the mean heart rate was 77 beat/min, and the mean body temperature was 36.4 °C. Their past histories included 47% with hypertension, 10% with diabetes mellitus, 16% with stroke, and 20% with heart disease.

Characteristics of patients with positive head CT

Table 2 shows the patients with positive head CT findings; four showed subarachnoid hemorrhage and one showed brain-stem hemorrhage. No patient had a neurological deficit.

Significant factors predicting positive head CT on logistic regression analysis

Table 3 shows the results of a logistic regression analysis of the positive head CT findings, performed with a stepwise procedure. The objective variable was defined as a positive head CT finding (hemorrhage stroke). The explanatory variables were age, sex, vital signs on admission (systolic and diastolic blood pressures, heart rate, body temperature), and past history (hypertension, diabetes mellitus, heart disease, stroke). Diastolic blood pressure was a statistically significant factor predicting a positive head CT finding ($p=0.010$).

Discussion

There is no consensus opinion on the indications for head CT in patients with a syncope episode. The guidelines for syncope treatment include no statement regarding head CT, (2-3) and retrospective studies have not shown a need for head CT as part of the treatment for syncope. (4-5) However, 3.7% of patients with a missed diagnosis of subarachnoid hemorrhage had syncope episodes. (6) Emergency departments with a head CT protocol for syncope patients have shown prospectively that the incidence of positive head CT findings is 5%. (1) Our retrospective study of syncope patients also demonstrated a 5% incidence of positive head CT results in patients evaluated with a head CT protocol. Therefore, the management of syncope patients with a head CT protocol certainly identified patients with hemorrhagic stroke.

In the Japanese clinical setting, head CT is an easily accessible clinical tool in emergency departments. Therefore, physicians routinely use head CT in the assessment of syncope patients, especially those transferred by ambulance. However, a large number of head CT scans are negative, so an effort should be made to reduce this number. In this study, we retrospectively examined the factors related to a positive head CT based on the patients' general clinical parameters, vital signs, past history, etc.

Our study results show that the diastolic blood pressure (dBP) was a significant factor predicting a positive head CT scan, and that patients with dBP<80 mmHg did not display positive results on head CT. This cutoff value for dBP is suggested to distinguish patients with hemorrhagic stroke from those with hypovolemia, vasovagal reflex, etc. Using this cutoff value as the indication for a CT scan in this context, we could reduce the number of head CT scans by 65.2%, according to the present data.

The consensus indication for head CT is consciousness disturbance. Our study examined patients with a GCS score of 14–15, who should provide trustworthy neurological findings. However, all five patients with a positive head CT had a GCS score of 15, for which there is no indication for head CT, even though a GCS score of 14 is considered to reflect consciousness disturbance.

A previous study retrospectively examined five patients with positive head CT scans, who were clinically asymptomatic in terms of the indications for head CT (headache, trauma episode, etc.). (1) However, this retrospective analysis could not adequately justify intervention with head CT. Therefore, a large prospective cohort study of syncope patients evaluated with a head CT protocol is required to address this problem.

This study had some limitations. The sample was small, and limited clinical data were obtained from the medical records. A retrospective study cannot correctly reflect unexpected cases of positive head CT.

Conclusion

We have demonstrated that diastolic blood pressure is significantly related to positive head CT findings (hemorrhagic stroke) in the management of patients with syncope. To confirm this result, a large prospective cohort study that examines syncope patients with a head CT protocol is required.

Conflict of interest statement

All work was conducted independently of the funding bodies, which had no influence on the study design or publication decisions.

Table 1. Patient characteristics

Variables	n=97
Age (yrs) (Mean±SD)	67.6±18.6
Sex (male/female)	53/44
Vital signs on admission (Mean±SD)	
Systolic blood pressure (sBP)	130±28.7
Diastolic blood pressure (dBP)	73.1±15.4
Heart rate (beat/min)	77±19
Body temperature (°C)	36.4±0.94
Past history (%)	
Hypertension	46 (47%)
Diabetes mellitus	10 (10%)
Stroke	16 (16%)
Heart disease	19 (20%)

Table 2. Patients with positive head CT findings

Patient	Age (yrs)	Sex	Head CT findings	sBP (mmHg)	dBP (mmHg)
1	59	Male	SAH	150	87
2	76	Male	Brain-stem hemorrhage	135	85
3	51	Male	SAH	157	88
4	52	Female	SAH	190	105
5	78	Female	SAH	173	96

Legend: CT=computed tomography; SAH=subarachnoid hemorrhage; sBP=systolic blood pressure on admission; dBP=diastolic blood pressure on admission

Table 3. Logistic regression analysis with stepwise procedure for positive head CT

Variable	p value	Odds ratio
dBP	0.010	1.092 (1.021-1.166)

Legend: dBP=diastolic blood pressure

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