PROGNOSTIC FACTORS IN HYPERTENSIVE INTRACEREBRAL HEMORRHAGE – STUDY ON A GROUP OF 80 PATIENTS

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ABSTRACT

Introduction. Hypertensive cerebral hemorrhage remains a severe disease with ahigh mortality.Current therapeutic options (including surgery) are limited, therefore prognostic elements are important in selecting patients for the testing of more aggressive future therapies. Prognosis depends on the location of the lesion (supratentorial versus infratentorial), size of hematoma, state of the patient at admission (measured by GCS scale), patient age and associated comorbidities.

Objective and method. Clinical and imaging correlations of various vital prognostic factors for ICH were evaluated (Glasgow Coma Scale, volume of hemorrhage, presenceand volume of ventricular blood, location of bleeding, patient age). The hypothesis of integration of all these prognostic factors was tested and external validation of the ICH prognostic scores was tried. ICH score is one of the predictors for mortality at 30 days due to cerebral hemorrhage. We analyzed 80 patients with cerebral hemorrhage admitted to the National Institute of Neurology and Neurovascular Diseases Bucharestand we evaluated the independent prognostic factors above, but also integrated them into the ICH score which we correlated with the death rate.

Results and conclusions. The deaths rate in the study group was 39%. The presence of intraventricular blood was associated with a higher death rate and this rate was directly proportional to the amount of intraventricular blood.ICH score was externally validated in this cohort study as a reliable prognostic method, relatively easy to use and accurate for vital risk assessment in patients with cerebral hemorrhage.

Key words: ICH score, intracerebral hemorrhage

INTRODUCTION

Spontaneous, non-traumatic, intracerebral hemorrhage represents about 8-15% of all cases of stroke (1). Mortality at 30 days in the case of cerebral haemorrhage is between 35 and 52%, half of the deaths occurring in the first 48 hours. The prognosis may depend on the location of the ICH (supratentorial versus infratentorial), hematoma size, presence and volume of intraventricular blood, state of arousal of the patient at admission (measured by GCS scale), patient age and associated pathology (2).

PATIENTS AND METHOD

Independently predictive factors for mortality at 30 days in patients with intracranial hemorrhage are GCS score, age over 80 years, the infratentoriallocation of the hemorrhage, hematoma volume and the presence of intraventricular bloodand continued bleeding after onset (demonstrated by repeated CT scans, but predictedby the "point" sign on the onset CT contrast examination). ICH score is a reliable and fast method forvital risk assessment of patients with cerebral hemorrhage. Other scales that quantify the risk of mortality in these patients (all usingas main parameters the patient's condition on admission commonly measured by GCS score and hematoma volume) tend to use complex algebraic equations whence the difficulty to be used in clinical practice (3). In this study we enrolled 80 consecutive patients with intracranial hemorrhage admitted to the National Institute of Neurology and Neurovascular Diseases Bucharest in theNeurology, Neurovascular Emergency and

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Neurologic Intensive Therapy Wards, from 1 March 1st 2012 to August 1st 2012. In these patients we studied the topographic distribution of lesions according to the presence or absence of hypertension. We also independently assessed the prognostic factors we estimated as being significant, we calculated the ICH score (Table 1) and we correlated it with the death rate.

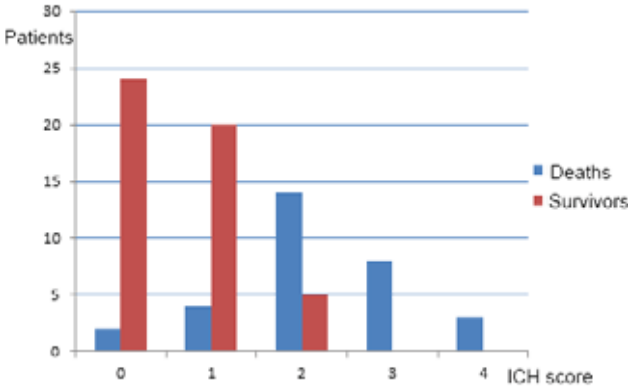

FIGURE 1. *Mortality according to ICH score*

TABLE 1. *Calculus method for the ICH score*

ICH score component	ICH Score
GCS score	
3-4	2
5-12	1
13-15	0
ICH Volum (cm$^{3)}$*	
≥30	1
<30	0
IVH**	
Yes	1
N0	0
Infratentorial location of ICH	
Yes	1
No	0
Age (years)	
≥80	1
<80	0
ICH total score	0–6

** ICH volume calculatedby ABC/2 method on initial CT scan*
*** IVH reprezents presence/absence of intraventricular blood on initial CT scan*

Intraventricular extension of blood is an important independent predictor of poor outcome (4,5,6). Intraventricular blood volume measurement was made using the IVH score (IVHS) (Table 2).

$$\mathbf{IVHS = 3 \times (RV + LV) + III + IV + 3 \times H}$$

where RV is the score for the right ventricle (0-3), LV is the left ventricle score (0-3), III is the third ventricle score (0-1), IV is the score for the fourth ventricle (0-1) and H is the score for the presence of hydrocephalus (0-1). For the grading of the lateral ventricles, the values were as such: 0 for lack of intraventricular blood or a small amount of blood, 1 for a quantity of blood up to a third of the ventricular volume, 2 foraquantity of blood of one to two thirds of the ventricular volume and 3 for a ventricle filled or near completely filled with blood. For the III and IV ventricles the score was 0 if there was no blood in the ventricle or 1 if the ventricle was partially or completely filled with blood. The presence of hydrocephalus was scored 1 and it's absence 0.

Conversion from IVH score to volume is done using the formula:

$$\mathbf{IVH\ volume\ (mL) = e^{IVHS/5}}$$

TABLE 2. *Calculated volumes (ml) based on the IVHS score*

IVH Score	Volume (ml)	IVH Score	Volume (ml)
1	1.2	**13**	13.5
2	1.5	**14**	16.4
3	1.8	**15**	20.1
4	2.2	**16**	24.5
5	2.7	**17**	30.0
6	3.3	**18**	36.6
7	4.1	**19**	44.7
8	5.0	**20**	54.6
9	6.0	**21**	66.7
10	7.4	**22**	81.5
11	9.0	**23**	99.5
12	11.0		

RESULTS

The group included 80 patients, 46 men and 34 women. The mean age was 66 years for women and 62 years for men. 93% of the patients were hypertensive. Regarding the location of the lesions there were 23 thalamic hemorrhages (thalamo-capsular and/or thalamo-mesencephalic), 25 basal ganglia hemorrhages, 6 in the pons(4 with midbrainextension), 2 in the midbrain, 10 major hemispherical-hemorrhages, 3 cerebellar hemorrhages, 10 lobar hemorrhages and1 in the head of the caudate nucleus (Figures 2 and 3)

There were 31 deaths (39%), 12 women and 19 men, from which 11 occurred within the first 24 hours after admission. Mortality according to topography was 13% for thalamic hemorrhage, 33% for the cerebellar localisation, 36% for the basal ganglia, 40% for lobar hemorrhage and 50% for pontine hemorrhage. To assess whether in our

group the ICH score had an influence on survival, we performed a χ^2 test (Table 3), which gave the result that the death rate increased with the ICHscore, the result being statistically significant (χ^2= 42.7, P value <0.001).

The presence of intraventricular hemorrhage led to a significant increase in the rate of death in the study group (relative increase of 80%) (Figure 4). To determine the statistical signifianceof the result we conducted an exact Fischer test, obtaining a P value of 0.03.

Also the death rate was directly proportional to the amount of intraventricular blood. To compare the means we performed an unifactorial analysis of variance (ANOVA), noticing that the variance was highly heterogeneous (F 1,25 = 12.99 with a p valueof 0.001). The average volume of intraventricullar blood in the deceased patients was 10.66 ml, in those who survived being 2.65 ml (Figure 5).

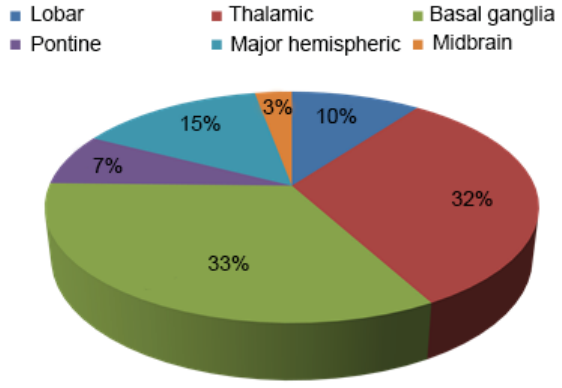

FIGURE 2. *ICH topography in hypertensive patients*

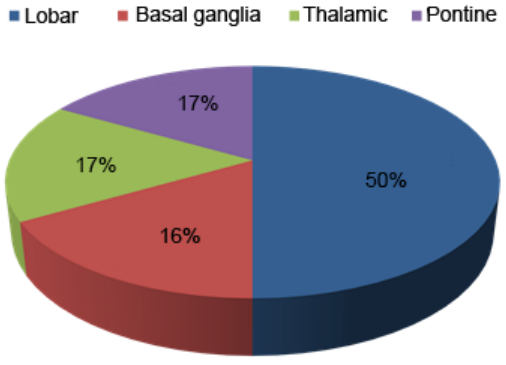

FIGURE 3. *ICH topography in non-hypertensive patients*

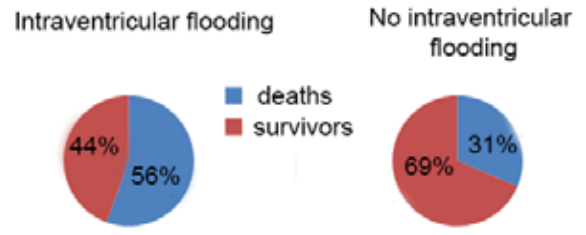

FIGURE 4. *The percentage of deaths depending on the presence or absence of intraventricular blood*

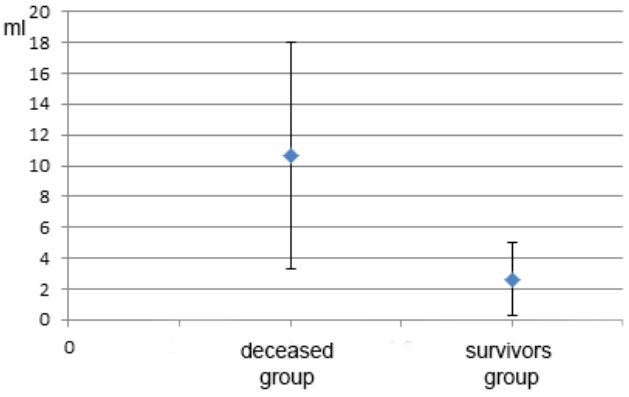

FIGURE 5. *Intraventricular blood volume means for the deceased and the surviving ± one standard deviation*

TABLE 3. *Contingency table for the χ^2test*

ICH score	Deaths	Nondeaths
0	2	24
1	4	20
2	14	5
3	8	0
4	3	0

DISCUSSIONS

According to the data from the literaturethe topographicaldistribution of intracerebral hemorrhage is 40-50% basal ganglia, 20-50% lobar location, 10-15% thalamus, 5-12% pontinelocation, 5-10% in the cerebellum and1-5% in the brainstem – other than the pons (9). In our group the percentages were similar (~ 44% for basalganglia hemorhage,7.5% for pontine hemorrhage, 2.5% for midbrain, 4% cerebellar hemorrhage) with the exceptions of thalamic hemorrhage which was higher at 29% and lobar hemorrhage that was lower at 12.5%. The large number of hemorrhages in the basal ganglia and thalamus (typical localization for hypertensive ICH) was probably due to the large number of hypertensive patients in the lot, ahigh percentage (55%) of whomneglected their treatment.

According to a study conducted in Spain, who enrolled 229patients and which was designed to determine the influence of topographyon hospital mortality, death rates by location were 16.3% for the basal ganglia, 20% for the cerebellum, 25% for lobar location, 25.8% for thalamus and to 40% brainstem. Also the presence of intraventricular blood was associated with a significantly increased death rate for all locations except lobar (10). In our group, mortality according to topography of the lesion was 36% for bleeding in the basal ganglia, 33% for cerebellar hemorrhage, 50% for pontine

hemorrhage. For the thalamic andlobar hemorrhagesdeath rates were significantly different, 13 % respectively 40%. Higher mortality for lobar hemorrhages can be explained by a larger volume of the hematoma, in out lot the average volumefor these patientsbeing approximatively 43mL.

CONCLUSIONS

The rate of deaths in the study group was 39%, about a third of the deaths occuring in the first 24 hours from admission. The most frequent location of ICH in hypertensive patients was basal ganglia followed at just one percent by the thalamus. In the nonhypertensive group lobar hemorrhage was the most frequent location, possibly due to amyloid angiopathy. The presence of intraventricular blood was associated with a higher death rate, which was directly proportional to the amount of intraventricular blood. ICH score was externally validated in this cohort study as a reliable prognostic method, relatively fast and accurate for vital risk assessment of patients with intracerebral hypertensive hemorrhage, usefull for selecting the patients with poor prognosis and high risk of rapid worsening in an early therapeutic window for the testing of future treatments,who will, hopefully, provemore efficient than the existing ones that have had so far limited therapeutic value.

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