Original Article

Predictors of outcome in patients with spontaneous intracereberal hemorrhage admitted to Liaquat University Hospital

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ABSTRACT

Objective: To study the frequency of mortality and evaluate the influence of various prognostic factors such as Glasgow Coma Scale (GCS) Score, volume of hematoma and age on the outcome of the patient admitted with intracereberal hemorrhage.

Methodology: This descriptive case series study was conducted at Liaquat University of Medical &Health Sciences hospital from July 2006 to March 2008. It included 399 consecutive patients with a diagnosis of SICH within 24 hours of their first stroke onset. Patients excluded from study were with hemorrhage secondary to brain tumors, to trauma, to hemorrhagic transformation of cerebral infarct and with previous history of hemorrhagic stroke. The patients' data was collected in a well designed Proforma. The volume of hematoma was calculated according to ABC/2 formula. Quantitative variables were described as mean with±SD. While qualitative variables were described as frequency and percentages. Age, GCS score and volume of hematoma compared to the outcome of the patients by receiver operating characteristics (ROC). The level of Significance was <0.05.

Results: This study included 399 patients of which 261(65.4%) were male and 138(34.6%) were female. The number of patients <65 years were 222 (55.6) whereas 177 (44.4%) patients were >65 years old. The number of patients who died during hospitalization were 122(30.6%) and 277 (69.4%) patients remained alive. AUR comparing the volume of hematoma is 0.707(p=0.001), GCS on admission 0.815(p=0.001) and age had 0.552 (p=095).

Conclusion*:* This study showed elderly patients with decreased level of consciousness and hemorrhage > 60 ml have the worst outcome.

KEYWORDS: GCS scores, Hematoma, Intracerebral hemorrhage.

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INTRODUCTION

Primary intracerebral hemorrhage (PICH) is defined as bleeding that evolves within the tissue of the brain. Primary nontraumaticintracerebral hemorrhage (ICH) comprises 10–15% of all strokes and remains without a proven worthwhile medical or surgical treatment.[1]

It is of great concern for the physician as well as the family whether the patient admitted for the episode of severe ICH will survive or not. Recently because of the early diagnosis and prompt management of small hematoma, the overall acute mortality

of ICH has declined to around 30%.[2] Several studies have focused on early survival after ICH and on the identification of its prognostic factors.[3] These factors include neurological features, other clinical parameters, laboratory results, and neuroimaging findings. Of various characteristics, level of consciousness on admission (as the Glasgow Coma Scale [GCS] score) and hematoma volume are the most consistent outcome predictors. Less consistent factors include age, presence and degree of intraventricular hemorrhage (IVH), presence and degree of hydrocephalus, brainstem hemorrhage, and medical complications. This lack of a simple, standard, widely accepted clinical grading scale or early prognostic model for ICH similar to those available for ischemic stroke and SAH may have contributed to heterogeneity in recruitment criteria for previous ICH studies and variability in clinical management of ICH.

The aim of the present study was to find out the mortality rate and to evaluate the effects of various prognostic factors such as, Glasgow Coma Scale (GCS) Score, volume of hematoma and age on the outcome of the patient admitted with intracereberalhemorrhage. By knowing the prognostic factors at the time of admission will help us to understand the prognosis of the patient and also to explain the same to anxious relatives.

METHODOLOGY

This descriptive case series study included 399 consecutive patients received in medical wards at Liaquat University hospital Jamshoro/Hyderabad with a diagnosis of SICH within 24 hours of their first stroke onset, between July 2006 to March 2008. Informed consent was obtained from all patients included or their legal representative. SICH was defined as a neurological deficit documented by a brain computed tomography (CT) indicating the presence of an ICH in absence of trauma or surgery.[4]

Admissions fulfilling the following criteria were excluded: patients with hemorrhage secondary to brain tumors, to hemorrhagic transformation of cerebral infarct, with previous history of hemorrhagic stroke. All patients were screened according to a strict protocol consisting of a medical history, a full neurological examination, standardized blood tests, and a CT scan of the brain within 24 hours. The Glasgow Coma Scale (GCS) assessed initial level of consciousness, and it was determined after initial evaluation and resuscitation.[5] The patients were categorized in to three groups with GCS score 3-4 in group one, GCS 5-12 in group two and GCS >12in group three. The following data was collected in a specifically designed proforma: age, sex, recognized risk factors for SICH (arterial hypertension, alcohol intake, smoking, diabetes mellitus, lipid profile levels, antiplatelet treatment), glucose levels at admission and 72 hours after stroke onset, systolic, diastolic, and mean arterial pressure (MAP) = [(2 x diastolic)+systolic] / 3, GCS scores, and CT scan findings. Patients were grouped in two with one having age < 65 and group two age ≥65 years. On the basis of MAP patients were categorized in to two with group one having MAP <130mmHG and group two ≥130mmHG. Neuroradiological findings were determined in the CT scan and classified according to localization (supratentorial or infratentorial), site of SICH (basal ganglia, thalamic, lobar), volume of hematoma (according to ABC/2 method, in which A is the greatest diameter on the largest hemorrhage slice, B is the diameter perpendicular to A, and C is the approximate number of axial slices with hemorrhage multiplied by the slice thickness)[7], midline shift (the displacement of the septum pellucidum across midline, using as reference a perpendicular line connecting the anterior and posterior insertions of the cerebral falx at the level of the lateral and third ventricle[6,7], intraventricular extension of hemorrhage (graded according to Graeb's scale).[8]

On the basis of volume of hematoma patients were categorized into three with one group having volume < 30 ml, group two 30-60 ml and group three>60ml. The functional outcome was assessed using the Glasgow Outcome Scale (GOS) which range from score 1 as dead and 2 vegetative state, 3 severe disability (Able to follow commands/ unable to live independently), 4 moderate disability (Able to live independently; unable to return to work), 5 good recovery (Able to return to work). The patients were categorized as good if their score was (GOS 4 to 5) and worse (GOS 1 to 3) functional outcome.[9] The functional outcome was assessed daily during hospitalization. Patients requiring hospitalization for more than three weeks for improvement in functional outcome were labeled as prolonged hospitalization.[9] All standard investigations such as blood sugar, lipid profile, were done from research lab of Liaquat University Hospital Hyderabad/Jamshoro. CT scan was done from the radiology department of Liaquat University Hospital Hyderabad/Jamshoro.

Statistical Analysis:

Categorical variables such as age < 65 years and ≥ 65 years, sex, volume of hematoma < 30 ml, 30-60 ml

and > 60 ml, GCS score 3-4, 5-12 and 13-15 and, Mean arterial pressure (MAP) < 130 mm of Hg and ≥130 mm of Hg, H/O hypertension and diabetes mellitus and site of hematoma such as thalamus, putamen and lobar and outcome of the patient such as dead or alive were expressed as frequency and percentage and Continuous variables such as blood glucose, serum cholesterol with mean and standard deviation.

Receiver-operating characteristic (ROC) curves were used to determine the cutoff values of age < 65 years and≥65 years, volume of hematoma < 30 ml, 30-60 ml and > 60 ml, GCS score 3-4, 5-12 and 13-15 and at 0.5 level in discriminating between patients who remain hospitalized for prolong period due to functional disability and those who died. The validity of the models was measured by the concordance (c) statistic (Equivalent to the area under the ROC curve), and the c-statistic of models were compared using chi-squared test as described by Hanley and McNeil.[10] A P-value < 0.05 was considered as statistically significant. A model was considered to have diagnostic accuracy if the c-statistic was 0.5 and excellent diagnostic accuracy if the c-statistic was > 0.5. All calculations were done using SPSS version 16 (Chicago, IL, USA).

RESULTS

This study included 399 patients of which 261(65.4%) were male and 138(34.6%) were female. The number of patients <65 years were 222 (55.6) and, 177 (44.4%) patients were >65 years old. H/O hypertension was present in 256(64.2%) and 142(35.6%) patients had no H/O hypertension. Mean arterial pressure was < 130 mm HG in 274 (68.7%) and >130mmHG in 125 (31.3%) patients. Diabetes mellitus was present in 187(46.9%) cases. GCS score at the time of admission was 3-4 in 120(30.1%) 5-12 in 203(50.9%) and 13-15 in 76(19%) patients. Volume of hematoma was <30ml in 183(45.9%), 30-60ml in194 (48.6%) and >60 in 22(5.5%) patients. Mean cholesterol level was 170 mg/dl ±30.19 and blood sugar 160 mg/dl±60.32.

Table-I: Baseline Characteristics of Patients.

Continuous Variables	*Mean*	*±SD*
Blood Sugar (mg/dl)	160	62.32
S.cholestrol (mg/dl)	170	30.19
Categorical Variables	*Frequency*	*Percentage*
Gender		
Male	261	65.4
Female	138	34.6
Age of Patients		
<65	222	(55.6)
>65	177	(44.4)
Mean Arterial pressure		
≤130 mmHg	274	(68.7)
>130mmHg in	125	(31.3)
GCS Score		
3-4	120	(30.1)
5-12	203	(50.9)
13-15	76	(19)
Volume of Hematoma		
<30ml	183	(45.9)
30-60ml	194	(48.6)
>60ml	22	(5.5)
Site of Lesion		
Thalamus	174	(43.6)
Putamen	81	(20.3)
Lobar	144	(36.1)
Outcome of Patients		
Dead	122	(30.6)
Alive	277	(69.4)

Abbreviations: GCS = Glasgow Coma Scale.

Site of lesion was thalamus in 174(43.6%), putamen in 81(20.3%) and lobar was in 144 (36.1%) patients. The number of patients who died during hospitalization were 122(30.6%) and 277 (69.4%)

Table-II: Result of AUCROC (Area Under Curve Receiver Operator Characteristic) Comparing age < 65 years and ≥65 years, volume of hematoma < 30 ml, 30-60 ml and >60 ml, GCS score 3-4, 5-12 and 13-15 with the Outcome of the patients.

Variables	*Sensitivity (%)*	*Specificity (%)*	*PPV (%)*	*NPV (%)*	*P-Value*
GCS	91	23.5	60	98	0.021
Volume of Hematoma volume (ml)	81	57.8	90	98	0.001
Age (Years)	51.6	58.8	60	96	0.095

Abbreviations: GCS = Glasgow Coma Scale, PPV = Positive Predictive Value, NPV = Negative Predictive value.

patients remained alive. Table-I shows all the characteristic of patients studied.

Comparison of the volume of hematoma with the outcome of the patients showed 23 dead and 160 alive with volume < 30 mls and 85 dead and 109 alive with hematoma between 30-60 mls and 14dead and 8 alive with hematoma > 60mls (p= 0.001). GCS at the time of admission was 3-4 in 92 dead and 28 alive and 5-12 in 19 dead and 184 alive and GCS score 13-15 was present in 11 dead and 65 alive patients (p=0.001).Comparing the age of the patient 59 died and 163 remained alive <65 years old and 63 died and 114 were alive at age > 65 years (0.034). AUR comparing the volume of hematoma is 0.707(p=0.001), GCS on admission 0.815(p=0.001) and age had 0.552 (p=095), ROC comparing the volume of hematoma to the outcome has sensitivity of 81.1% and specificity of 57.8%, GCS has sensitivity of 91% and specificity of 23.5 and age has sensitivity of 51.6 and specificity of 58.8%. (Table-II)

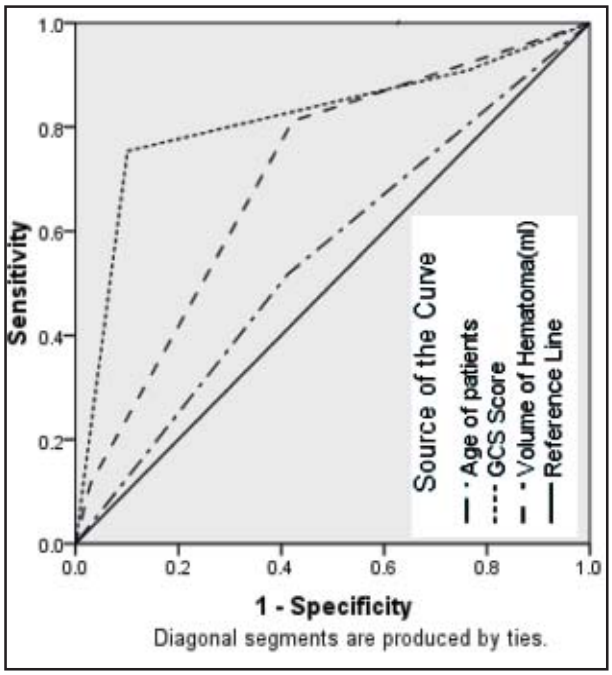

Fig-1: Receiver operating characteristic (ROC) curve comparing age <65 years and ≥65 years, volume of hematoma <30 ml, 30-60 ml and >60 ml, GCS score 3-4, 5-12 and 13-15.

DISCUSSION

The short-term prognosis in primary ICH has been systematically evaluated in surprisingly few studies.[11] In our study predictive value of various factors such as age, GCS score and intracerebral volume influencing the outcome of patients with primary intracerebral hemorrhage were assessed. The number of patients who died during hospitalization were122 (30.6%). Steiner[12] reported a mortality rate of 26% in 1984, Helweg-Larsen[13] 27% in 1984, Douglas and Haerer[14] 40% in 1982, J. Claude Hemphill[15] 40% in 2009 and Mansooreh Togha[16] 46.7% in 2004. Garraway found a 58% mortality rate in their post-CT study.[17] We used the degree of improvement in functional status as the outcome measure whereas others have used functional status at discharge[13] or at set times after stroke.[14] In our study more deaths were found in patients >65 years of age. Age has been found to be an independent predictor of ICH outcome in some prior prediction models, while age has not been associated with outcome in others.[18] The fact that age has been an inconsistent ICH outcome predictor among various models and may have its strongest influence among the group of very elderly patients suggests two possibilities. Either the very elderly sustain worse neurological injury from ICH irrespective of size or location, or overall medical care decisions in elderly patients are less aggressive even if ICH-related neurological injury is not as profound. The most important clinical indicator in our study was the level of consciousness as measured by the Glasgow Coma Score. The GCS score is now a standard neurological assessment tool that is reproducible and reliable.[19] It has been associated with ICH outcome in other prediction models.[20] Levels between 3-4 correlated with a poor prognosis. Likewise, patients with GCS scores of >13 tend toward much better outcome.

According to Broderick JP, Brott T, patients in whom the hematoma volume was 60cm three or greater and the GCS score was 8 or less, the predicted 30- day mortality rate was 91% compared with only 19% in those in whom the volume was less than 30 cm three and the GCS score was 9 or more.[21] Size of the hemorrhage has been reported to correlate well with acute ICH mortality.[22,23] In this study volume of hematoma has remained an important predictor of mortality, in agreement with Bhattathiri PS et al[24] and Davis SM et al[25] J. Claude Hemphill contradicts the size of volume as strong predictor of outcome and stated that other predictors such as low GCS score, advanced age, or IVH influenced outcome to a greater degree.[26]

Magnetic Resonance Imaging (MRI) of brain would have been more informative in detecting the infratentorial extension of the hemorrhage. It was not performed because of non availability of the facility in institute as much of the required information was achieved from CT scan of brain.

In conclusion, our experience and other recent series[2,15] indicate that a good neurological outcome can be expected in about half the cases of primary ICH with conservative management. Elderly patients with decreased level of consciousness and hemorrhage >60 ml have the worst outcome.

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