

Original Article



Relation of Volume of Hemorrhage With Mortality Within First 48 Hours in Hemorrhagic Stroke.

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Abstract

Background: Hemorrhagic stroke accounts for 10-15% of all strokes with higher mortality rates than cerebral infarction. Intracerebral hemorrhage has a reported 30-day mortality of 44% to 51%, with almost half of the death occurs within the first 48 hours. Advanced age, low level of consciousness, large volume of hemorrhage has been linked with poor outcome. **Objectives:** To predict early outcome of hemorrhagic stroke patient in relation with age, Glasgow Coma Scale, volume of hemorrhage and ventricular extension. **Materials and Methods:** Hospital based prospective study carried out in hundred hemorrhagic stroke patients. The formula of ABC/2 was used to calculate hemorrhage volume in bedside by using CT scan. **Results:** 1st month mortality rates of hemorrhagic stroke was 44% with 45.45% of patients died within the first 48 hours of onset. Mean age of patients of hemorrhagic stroke was 61.2 ± 13.88 years. Mortality rate of intracerebral hemorrhage after age of 60 was 51.06% in 1st month. Volume of intracerebral hemorrhage was the strongest predictor of both 48 hours and 30 days mortality. Using three categories of intracerebral hemorrhage (X for < 30 ml, Y for 30 - 50 ml and Z for > 50 ml group) calculated by ABC/2 formula showed 100% mortality rate in Z group, 50% in Y group and only 12% mortality rate in X group in 1st month. Among all death, 61.5% of Z group 25% of Y group and 16.67% of patients of X group died within 48 hours. Two categories of Glasgow Coma Scale (≤ 8 and ≥ 9) were used and shown death rates 80.77% in GCS ≤ 8 and 4.55% in GCS ≥ 9 in 1st month. **Conclusion:** Volume of intracerebral hemorrhage in combination with advanced age, initial Glasgow Coma Scale is a powerful and easy to use in both 48 hours and 1st month mortality in patients with spontaneous intracerebral hemorrhage.

Key words: Hemorrhagic stroke, Volume of Hemorrhage, Mortality.

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Introduction:

Hemorrhagic strokes result in tissue injury by causing compression of tissue from an expanding hematoma or hematomas. This can distort and injure tissue. In addition, the pressure may lead to a loss of blood supply to affected tissue with resulting infarction, and the blood released by brain hemorrhage appears to have direct toxic effects on brain tissue and vasculature.^{1,2} If the amount of blood increases rapidly, the sudden buildup in pressure can lead to unconsciousness or death.

Hemorrhagic stroke accounts for 10-15% of all strokes and is associated with higher mortality rates than cerebral infarctions,³

and incidence increases with increase age.^{4,5} Predilection sites for intracerebral hemorrhage include the basal ganglia (40-50%), lobar regions (20-50%), thalamus (10-15%), pons (5-12%), cerebellum (5-10%), and other brainstem sites (1-5%).⁶

Intracerebral hemorrhage is more common in men than women, particularly those older than 55 years of age, and in certain populations, including blacks and Japanese.^{4,5,7}

Hemorrhagic stroke has a reported 30-day mortality of 44% to 51% in population studies during the computed tomographic (CT) era, with almost half of the patients die within the first 48

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hours.^{4,8-10} Level of consciousness, volume of parenchymal hemorrhage and to a lesser extent intraventricular hemorrhage has been most consistently linked with poor outcome.¹⁰⁻¹⁵ In general, supratentorial hematomas with volumes <30 ml have a good prognosis; 30–60 ml have an intermediate prognosis; and >60 ml have poor prognosis during initial hospitalization.¹⁶ Extension into the ventricular system worsens the prognosis, as does advanced age, location within the posterior fossa, and depressed level of consciousness at initial presentation.¹⁶⁻¹⁸ Pontine hemorrhage greater than 5ml and cerebellar hemorrhage greater than 30 ml may be considered most lethal with all patients die within 30 days.¹⁷

In one study shows that 30 day mortality for patients with a hematoma larger than 60 ml and GCS score of 8 or less is 91%, whereas the 30 day mortality for those with a volume of less than 30 ml and a GCS score of 9 or more is only 19%.^{17,19} The site is also important-brainstem hematomas are 100% fatal at 28 days, whereas the mortality for basal ganglia or thalamic hematomas is. 22%.²⁰

Several clinical and radiological factors such as age, level of consciousness, hypertension, volume of the hematoma, intraventricular spread of the hemorrhage, cerebral oedema and midline displacement on computed tomography (CT) appear to be markers of poor outcome. Though the volume of an intracerebral hematoma is known to be an independent predictor for poor outcome and mortality, however, only a few studies have shown these.^{11, 17}

Therefore, a quick and reliable bedside technique for estimating hematoma volume has been established, the so-called ABC/2 technique, which meanwhile has been validated repeatedly.^{21,22} So we calculate hemorrhage volume in bedside by using ABC/2 formula. A number of techniques have been developed to measure hemorrhage volume.^{11,17,18} Unfortunately, these methods often involve complicated formulas, require specialized equipment, or cannot be performed rapidly at the patient's bedside. We found that the simple formula ABC/2 can accurately estimate intracerebral hemorrhage volume and requires less than 1 minute for measurement and calculation. The goals of our study were to determine the hemorrhage volume by using a very simple formula ABC/2 and it will predict the outcome and mortality in bedside within a very short time.

Materials and Methods

This Prospective study was conducted at Department of Medicine in Sher-e-Bangla Medical College Hospital, Barisal between the period of 01/06/2011 to 31/01/2012. 100 cases of CT scan proved hemorrhagic stroke patient were included in this study. Hemorrhagic stroke with history of recent trauma to head, hemorrhage due to anticoagulant or antiplatelet therapy, CT scan evidence of a subarachnoid hemorrhage, isolated intraventricular hemorrhage and hemorrhagic stroke due to blood dyscrasia were excluded from this study. This study was approved by Ethical committee of Sher-e-Bangla Medical College, Barisal.

All stroke patients admitted in Medicine unit evaluated clinically and CT scan findings. Clinical assessment of outcome was done by assessing age, Glasgow Coma Scale (for assessing

conscious level), neck rigidity (for assessing ventricular extension), posterior fossa lesion (assessed by seeing signs of brain stem lesion, signs of cerebellar lesion, respiratory pattern and cardiovascular status). Volume of hemorrhage was measured by ABC/2 formula using CT scan. CT scan slice with the largest area of hemorrhage was identified. The largest diameter (A) of the hemorrhage on this slice was measured. The largest diameter 90° to A on the same slice was measured next (B). Finally, the approximate number of slices on which the intracerebral hemorrhage was seen was calculated (C). C was calculated by a comparison of each CT slice with hemorrhage to the CT slice with the largest hemorrhage on that scan. If the hemorrhage area for a particular slice was greater than 75% of the area seen on the slice where the hemorrhage was largest, the slice was considered 1 hemorrhage slice for determining C. If the area was approximately 25% to 75% of the area, the slice was considered half a hemorrhage slice; and if the area was less than 25% of the largest hemorrhage, the slice was not considered a hemorrhage slice. These CT hemorrhage slice values were added and multiplied by the slice thickness and determined the value for C. All measurements for A and B were made with the use of the centimeter scale on the CT scan to the nearest 0.5 cm. A, B, and C were then multiplied and the product divided by 2, which yielded the volume of hemorrhage in cubic centimeters. From day of admission to day 7 all patients were followed up twice daily. In each follow up pulse, blood pressure, Cardiac status, respiratory status, Glasgow Coma Scale, pupil, new focal sign and bed sore were assessed and any change in status were recorded. As shortage of bed in hospital could not allowed long duration stay, so those patients were discharged they were requested to attend follow up on 15th and 30th day in Medicine unit, and those who could not attend the follow up their information (outcome i.e. static / improved / death) had been collected over telephone. Results were calculated using Chi-square test.

Results

A total of 100 patients of hemorrhagic stroke were incorporated in this study. The results are as follows –

Table- 1: Distribution of patients by age (n=100).

Age of the patient	Total no. of patient	Percentage
< 50 yrs	24	24 %
50 - 60 yrs	28	28%
> 60 yrs	48	48%
Total	100	100%

Mean ± SD = 61.2 ± 13.88

• Majority of the patients incorporated in this study belongs to age group above 60 years (i.e. 48%), followed by 50 – 60 years group (which was 28%) (Table- 1).

Table – II: Distribution of patients by sex (n=100)

Sex	Total no. of patients	Percentage
Male	66	66%
Female	34	34%
Total	100	100%

• In this study 66% of patients were male and 34% of patients were female (Table – II).

Table –III: Distribution of patients according to outcome in 1st month (n=100).

Outcome	Total	Percentage
Death	44	44%
Within 48 hours	20	45.45%
48 hours to 1 month	24	54.55%
Static	42	42%
Improved	14	14%
Total	100	100%

• 44% of death occurs with 1 month of onset of intracerebral hemorrhage (ICH), of which 45.45% patients died within 48 hours of onset of ICH. 42% of patients were static and 14% patients improved in 1st month (Table –III).

Table– IV: Distribution of patients according to initial Glasgow Coma Scale (GCS) and 1st month mortality (n=100).

GCS	Group		Total	Chi-square test (x ²)	P-value
	Alive	Death			
≤ 8	10	42	52	x ² =59.44 p < 0.05*	
	19.23%	80.77%	52%		
≥ 9	46	2	48		
	95.83%	4.17%	48%		
Total	56	44	100		

• 52 patients presented with GCS ≤ 8 of which 42 patients (i.e. 80.77%) died on the other hand only 2 patients (i.e. 4.17%) out of 48 died with GCS ≥ 9 (Table – IV).

Table – V: Distribution of patients according to site of hemorrhage (n=100).

Site of hemorrhage	Total no. of patients	Percentage
Lobar	78	78%
Thalam us and Basal ganglia	8	8%
Brain stem	8	8%
Cerebellum	6	6%
Total	100	100%

• 78% of the patients presents with lobar hemorrhage followed by 8% thalamus and basal ganglia, 8% brain stem and 6% cerebellar hemorrhage (Table – V).

Table – VI: Distribution of according to volume of hemorrhage with 1st month mortality (n=100).

Volume of hemorrhage	Group		Total	Chi-square test (x ²)	P-value
	Alive	Death			
< 30 ml	44	6	50	x ² = 54.216 p < 0.05*	
	88%	12%	50%		
30–50 ml	12	12	24		
	50%	50%	24%		
> 50 ml	0	26	26		
	0%	100%	26%		
Total	56	44	100		
	56%	44%	100%		

• Mortality rate of hemorrhagic stroke in 1st month was 44%. This study shows increased size of hemorrhage increased mortality. Mortality rate of hemorrhage volume > 50 ml was about 100% in this study, where as mortality rate of hemorrhage volume < 30 ml was only 12% (Table – VI).

Table-VII: Distribution of patients according to volume of hemorrhage and onset of mortality (n=44).

Volume of hemorrhage	Death		Total	Chi-square test (x ²)	P-value
	Within 48 hours	48 hours to 1 month			
< 30ml	1 16.6 7%	5 83.3 3%	6 13.63%	x ² =6.729	p<0.05*
30-50 ml	3 25 %	9 75 %	12 27.27 %		
> 50 ml	16 61.5%	10 38.5%	26 59.10%		
Total	20 45.45%	24 54.55%	44 100%		

• 45.45% of patients (i.e. 20 out of 44 patients) died within 48 hours after onset of stroke of which 61.5% (i.e. 16 out of 26) of patients died with hemorrhage volume > 50 ml (Table – VII).

Table –VIII: Distribution of patient according to hemorrhage size with outcome (n=100).

Size of hemorrhage	Outcome			Total
	Death	Static	Improved	
< 30ml	6 12%	30 60%	14 28%	50 50%
30-50 ml	12 50%	12 50%	0 0%	24 24%
> 50 ml	26 100%	0 0%	0 0%	26 26%
Total	44 44%	42 42%	14 14%	100

• 100% mortality rate in hemorrhage size of > 50 ml group where as only 12% mortality rate in hemorrhage size < 30 ml group. 60% patients were static and 28% patients improved in hemorrhage <30 ml group (Table –VIII).

Discussion

One hundred patients with hemorrhagic stroke admitted in Medicine unit of Sher-e-Bangla Medical College Hospital, Barisal were included in this study within the time period of June 2011 to January 2012. All patients were selected as per inclusion criteria. Their presentation, risk factors and outcome were assessed.

In this study shows that (Table - I) mean age of patients of onset

of hemorrhagic stroke was 61.2 ± 13.88. This co-relates with studies shows hemorrhagic stroke occurs particularly those older than 55 years of age. ⁵ 51.06% of patients died in age group > 60 years followed by 43.75% in 50 – 60 years and 28.57% in < 50 years group, suggest mortality increased with increased age. ^{14,17}

This study shows that males were affected more than females (Table - II). Which co-relates with studies suggesting that intracerebral hemorrhage is more common in men than women. ⁵ 43.92% of male patients died in 1 month on the other hand 44.12% of female patients died in 1 month this shows mortality rates of hemorrhagic stroke were equal in both sex this correlates with other study done by Daverat P et al and Broderick JP et al. ^{14,17}

On evaluation of risk factors shows 58% of patients had risk factors of which 51.72% had multiple risk factors. Among the risk factors hypertension and smoking were the predominant risk factors in this study followed by diabetes and dyslipidemia. 64% of patients presenting with unconsciousness or H/O loss of consciousness, 42% of patients presented with hemiparesis, 34% with vomiting, 20% with aphasia / speaking difficulty, 18% with H/O fall on the ground, 8% with headache, 4% with cranial nerve involvement, 4% with breathlessness, 2% with fever and 4% presented with others symptoms. Most of the patients had multiple symptoms.

This study shows that 44% of patients died in 1st month of onset of stroke of which 44.45% died within 48 hours (Table - III), which co-relates with the study shown by Broderick et al they shown that 30 day mortality of ICH was 44%, with half of deaths occurring within the first 2 days of onset. ¹⁷

This study shows 80.77% of (42 out of 52) patients died with a GCS ≤ 8, where as 4.17% of patients (2 out of 48) died with GCS ≥ 9 (Table - IV), with a p – value < 0.05 that is statistically significant. Which strongly co-relates with several foreign studies. ^{17,23}

78% of the patients presented with lobar hemorrhage followed by 8% thalamus and basal ganglia, 8% brain stem and 6% cerebellar hemorrhage (Table – V). Anderson TS, Chakera TMH, Stewart-Wynne EG, Jamrozik KD showed that brainstem hematomas are 100% fatal at 28 days, whereas the mortality for basal ganglia or thalamic hematomas is. 22%. ²⁰

Volume of intracerebral hemorrhage as calculated by ABC/2 formulas using on CT-Scan were studied into three different categories < 30 ml, 30 – 50 ml and > 50 ml, Shown 100% death rates of hemorrhage size > 50 ml in 1st month. On the other hand death rates in 30 – 50 ml group were 50% and < 30 ml group were only 12% (Table –VI); with a chi-square test result was 54.216 and p-value < 0.05, that was statistically significant and coincide with the study hypothesis of increased volume of hemorrhage increased mortality. Broderick J et al shows that A model of 30 day mortality that used the Glasgow coma scale and hemorrhage volume in patients with intracerebral hemorrhage correctly predicted outcome with a sensitivity and specificity of 97%. ¹⁷

Deaths were categorized into death within 48 hours and 48 hours to 1 month, shows that 45.45% of death occurred within 48 hours after onset of stroke of all death occurred within 1 month correlates with the study done by Broderick JP et al,¹⁷ 61.5% of patients died within 48 hours of hemorrhage volume > 50 ml, 25% died in 30 – 50 ml and 16.67% died in < 30 ml group with chi-square test result 6.729 and p value < 0.05 (Table - VII). Survival rate increased with decreased size of hemorrhage, in < 30 ml hemorrhage size 28% improved, 60% were static and only 12% died whereas 50% died and 50% improved in 30 – 50 ml and 100% died in > 50 ml group in 1st month (Table - VIII).

P.M. Vespa et al showed midline shifting associated with poor outcome.²⁴ A study done by Thanh G et al shows hydrocephalus developed in 40% of patients of deep cerebral hemorrhage and hydrocephalus present in 76% of those who died.²⁵

Mortality increased with advanced age, low level of consciousness, increased volume of hemorrhage and with ventricular extension. This co-relates with several studies shows level of consciousness, volume of intracerebral hemorrhage and to a lesser extent intraventricular extension determine the poor outcome and mortality, as does with advanced age.^{10,14,16,17}

A study over 229 consecutive patients with ICH in Spain shows out of total 70 death hemorrhage was the culprit in 44 cases followed by pneumonia 8, sepsis 8, arrhythmia and myocardial infarction 4, pulmonary embolism 1 and unknown 5.²³ Sepsis and arrhythmia are the important cause of death in ICH is not identified in this study due to lack of intensive stroke unit and continuous cardiac monitoring in this study place hospital. So that death which could be prevented in acute stage was not possible in general ward setting.

Conclusion

Mortality rate of intracerebral hemorrhage is very high. Volume of intracerebral hemorrhage, in combination with the increased age, initial Glasgow coma scale and ventricular extension is a powerful and easy to use predictor of mortality proved in this study. The results of this study were not disharmonious with international studies. This is a small sample sized study so it is difficult to draw inference from it. A large sized study with greater matched variables and risk factors can be done in this matter to make a concrete comment.

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