Original Research Article

Clinical Profile of hemorrhagic stroke and validation of ICH score in Kashmiri population

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Abstract

Background: Intracerebral hemorrhage is the second most common subtype of stroke after ischemic stroke and accounts for approximately 10 % to 20 % of all strokes worldwide. In contrast, hemorrhagic stroke in our Kashmir valley accounts for around 65%. **Objective**: To look for detailed clinical profile and 30 day mortality, and correlate with ICH score, in our population. Study design and Methods: In this hospital based prospective study, All patients of spontaneous intracerebral hemorrhage admitted over a period of 2 years were enrolled. All clinical and lab parameters were recorded. ICH score (which includes Age, GCS, ICH volume, ICH location, and Intraventricular hemorrhage) was calculated at initial assessment. Patients were followed for 1 month to look for 30 day mortality and correlate with ICH score. **Observations:** Intracerebral hemorrhage constituted 51% of stroke patients after excluding SAH. Mean age of patients was 61.66±12.57 years. There was male preponderence (64%). Major risk factors present include Hypertension (96%), smoking (47%). DM (10.1%), previous stroke (11.3%), Family history (29.2%) and Anticoagulant use (0.85%).Most common site involved was Putamen (46.5%) followed by thalamus (27.8%) and lobar hemorrhage (14.6%). Around 65% patients developed systemic complications including Electrolyte disturbances and infections. Mortality at 30 days in our study was 36.2%. Thirty-day mortality rates for patients with ICH Scores 0f 0, 1, 2,3,4,5 were 0.7%, 4.5%, 17.3%, 62.0%, 94.6% and100.0% respectively. Plotting ICH score ROC curves demonstrated an area under the curve of 0.896, compared to 0.92 for the original ICH score cohort. **Conclusion:** Hemorrhagic stroke is still predominant stroke type in Kashmir valley. ICH score is an accurate marker to predict 30 day mortality in our population.

Keywords: dexmedetomidine, Endotracheal intubation, laryngoscopy

Introduction

Stroke is the second most common cause of death world wide and the third most common cause of disability.Intracerebral hemorrhage accounts for approximately 10 % to 20 % of all strokes, Although ICH proportion in Asia Is higher especially in china and Japan. India has a ratio of cerebral infarct to hemorrhage of 2.21[1-6]..Our part of country, the Kashmir valley, has different pattern of strokes with hemorrhagic strokes outnumbering ischemic strokes. In one of the largest studies from valley studying clinical profile of strokes; hemorrhagic stroke was reported in 64.7% of patients.(7)First published in 2001,[7,8].The ICH Score has subsequently been externally validated in numerous other cohorts and has been used as a stratification tool in a clinical trial of neuroprotection in order to improve balance of baseline characteristics.[9-11]. In this study, our aim was to look for detailed clinicoradiological profile of hemorrhagic stroke and relationship between ICH score and 30 day mortality in our population.

Materials and methods

This was a hospital based prospective study conducted at Sher-i-Kashmir institute of medical sciences, a tertiary care hospital. The study was cleared by institutional ethical committee. Patients,aged more than 18 years,of spontaneous ICH admitted to department of neurology were enrolled in study. Traumatic ICH, Venous strokes and SAH were not included in study Basic demographic and clinical profile was recorded in all cases. GCS was calculated at presentation and recorded. ICH characteristics were reported on the basis of CT scan of brain including site, location, volume, I/V extension. ICH hematoma volume was measured on the initial head CT scan with the use of the 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.[4] ICH Score (Table 1) was calculated in every patient to assess severity and correlated with mortality at 30 days.(8) Patients discharged were followed for 30 days to determine 30 day mortality.

Descriptive statistics were presented as overall frequencies or mean±SD values of specific parameters (as appropriate). For univariate analyses of categorical variables values were compared by Chi-Square statistics. Continuous variables and means were compared using student-t test. Age was analyzed both as a dichotomous categorical variable with a cut point at 80 years and continuous variable. Multiple binary logistic regression analyses were performed, initially including all potential predictor variables from univariate analysis, with stepwise elimination of variables not contributing to the model (P.0.10). Independent variables assessed in univariate and multivariate analysis included GCS, ICH volume, IVH, pulse pressure, age ≥80 years, Infratentorial origin, lab parameters, Gender, and complications. First-order interaction terms were tested in the final model. Jonckheere-Terpstra test (a nonparametric test) of trend was used to assess association of the ICH score with 30-day mortality .To compare the predictive value of the ICH score in the current cohort with that for the original ICH score cohort, the area under the curve was calculated for the receiver operating characteristic (ROC) curve of patients. Statistical analysis was performed with SPSS V.23.

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Table 1:Determination of the ICH Score

Component	ICH Score Points
GCS score	
3–4	2
5–12	1
13–15	0
ICH volume (ml)	
≥30	1
<30	0
IVH	
Yes	1
No	0
Infratentorial origin of ICH	
Yes	1
No	0
Age (years)	
≥80	1
<80	0
Total ICH Score	0–6
GCS score indicates GCS score on initial presentation (or after resuscitation);ICH volume, volume on initial CT calculated using ABC/2 method; and IVH, presence of any IVH on initial CT.	

Table 2:Clinicoradiological characteristics of ICH patients.

0		**Count**	**N %**
Age (Years)	80.0+	59	8.4%
	<= 79.0	642	91.6%
Gender	Female	254	36.2%
	Male	447	63.8%
GCS	≤ 4.0	57	8.1%
	5.0 - 12.0	361	51.5%
	≥13.0	283	40.4%
ICH Site	Basal Ganglia	332	47.4%
	Thalamus	195	27.8%
	Cerebellum	32	4.6%
	Lobar	102	14.6%
	Brainstem	24	3.4%
	IVH	6	0.9%
	Bilateral	10	1.4%
I/V extension	No	318	45.4%
	Yes	383	54.6%
Location	Infratentorial	58	8.3%
	Supratentorial	643	91.7%
ICH volume	<30	284	40.9%
	31-60	254	36.6%
	>60	156	22.5%

Observations and Results

We conducted a prospective study over a period of 2 years during which 701 eligible patients were enrolled in study. Clinico-radiological characteristics are presented in Table 2. Most of the patients were males (64%). Mean age of patients was 61.66±12.57.Most patients belonged to rural areas. Hypertension was most common Risk factor, Frequency of other risk factors was lesser as shown in Table 3.Most common presenting clinical feature was hemiparesis, seen in 78%, followed by 7th nerve palsy (75%). Other common signs and symptoms were Speech disturbance, altered sensorium, Headache, Seizure, vertigo, Vomiting, Incontinence and ataxia. Basal ganglia was the most common site of involvement, accounting for 47.4 %, followed by Thalamus (27.8%). Lobar hemorrhages (14.6%) were more frequent than cerebellar hemorrhages (4.6%). Ten patients had bilateral hemorrhages. Six patients had primary intraventricular hemorrhage. Left side was involved slightly more than right (52.9% vs 44.4%).Mean ICH volume was 42±28 ml. 40.9% patients had a volume less than 30 ml.59.1 % had a ICH volume of more than 30ml.Around 65% patients developed systemic complications including Electrolyte disturbances and infections.Around 150 had more than one complications. Most common was Hyponatremia (defined as serum sodium less than 135) followed by respiratory complications like aspiration pneumonia, HAP, Tracheobronchitis etc. Patients were followed up to 1 month. 254 out of 701 patients died during this period giving a 30 day mortality of 36.2%.Thirty-day mortality rates for patients with ICH Scores 0f 0,1, 2,3,4,5 were 0.7%, 4.5%, 17.3%, 62.0%, 94.6% and100.0% respectively(Fig 1).A Jonckheere-Terpstra test for ordered alternatives showed that there was a statistically

significant trend of higher mortality at 30 days with higher levels of ICH Score from 0 to 5.(TJT = 101,529, z = 17.914, p < 0.0001). To compare the predictive value of the ICH score in the current cohort the area under the curve was calculated for the receiver operating characteristic (ROC) curves for patients. Plotting ICH score ROC curves demonstrated an area under the curve of 0.896. (fig 2)compared to 0.92 for the original ICH score cohort(8), indicating that the ICH score performed comparably in both groups with regard to outcome risk stratification.

Table 3:Frequency of Risk factors and Complications developed during hospital stay.

Risk Factors	
HTN	674 (96.1%)
DM	71 (10.1%)
Smoking	336 (47.9%)
Previous stroke	79 (11.3%)
Family history	205 (29.2%)
Anticoagulant use	6 (0.85%)
Complications	
Hyponatremia (Na<135)	315 (44.9%)
Hypernatremia (Na>145)	36 (5.1%)
Respiratory complications like Aspiration, HAP etc	183 (26.1%)
Acute Renal Failure	44 (6.2%)
UTI and Other infections	58(8.2%)
Coagulopathy (INR>1.3)	57 (8.1%)
GI Bleed	10 (1.4%)

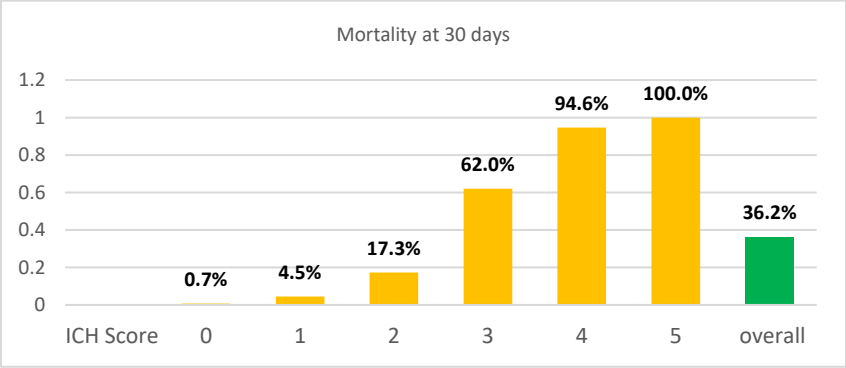

Fig 1:Relationship between mortality at 30 days and ICH score

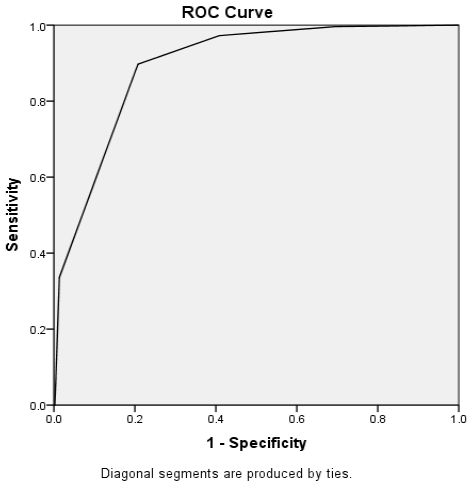

Fig 2:ROC Curve for ICH Score (AUC=0.896, P <0.001)

Table 4:ICH Score and 30 day mortality comparison of different studies.

	30 day mortality					
	Our study	Hemphill et al	Clark et al	Jamora et al	DA Godoy et al	Fernandes et al
0	0.7%	0	0	1%	0	4%
1	4.5%	13%	13%	5%	6.6 %	6%
2	17.3%	26%	39%	22%	34%	32%
3	62.0%	72%	78%	72%	56%	56%
4	94.6%	97%	96%	68%	70%	74%
5	100.0%	100%	100%	100%	100%	100%*
Overall	36.2%	45%	40%	23%	37.7%	N/A
*1 patient had a score of 6, no one had 5.						

Discussion

Intracerebral hemorrhage accounts for approximately 10 % to 20 % of all strokes; Although ICH comprises higher proportion in Asia especially in china and japan. ICH has a poor outcome, with an overall mortality of 40% to 50%.[12] We undertook a prospective study at Sher I Kashmir institute of medical sciences to look for 30 day mortality and predictive value of ICH Score in our population. All patients Of ICH admitted over a period of 2 years were included in this Study.A total of 701 patients were included in study. During same period 670 patients of ischemic stroke were admitted in Hospital. We did not include SAH and venous strokes in our study. This gave a percentage of 51% for ICH. This is contrary to world literature, especially to western world, where Spontaneous intracerebral hemorrhage (ICH) accounts for 10% to 15% of all strokes[13]. This is also higher than other Asian countries,[14,15]and other states of our country[5,6].This preponderance is already reported from our population by Shah et al. After excluding SAH and Venous Strokes the relative percentages of ICH and Ischemic strokes in that study were 70.8 % and 29.2% respectively[7]. As the data for above study was collected between 1996 and 2009; the lesser percentage of ICH in our study may be a demarcation of changing trend towards ischemic stroke. This may be partly explained by changing trends in obesity and DM[16,17] in our population which are more powerful Risk factors for Ischemic stroke. Other contributing factors may be changing lifestyle[18]. There was male preponderance in our study comprising of 64% vs 36% females. This is in concordance with study by Shah et al[7], where percentage of males was 64%. There was no significant difference in mean age between males and females. Mean age in males and females was 62.4±12.5 and 65.34±12.6 years respectively (P=0.76). Thirty day mortality in Males and females was 37.8% and 33.5% respectively (P=0.143). Many studies have looked at age comparison between gender; some reporting younger age of onset in females[19,20]while few reporting younger age in males[21]. Our study did not show any difference between ages in different genders, as reported in many other studies[22,23]. Ganti et al in their study reported a higher odds of mortality in females[24]. But most of studies like our study did not show any significant difference in mortality between males and females.[19,22]. Most common site of hemorrhage was Basal ganglia followed by thalamus, lobar ,cerebellum and brainstem. Similar results have been observed in other studies. The proportion of lobar hemorrhages in our study is higher than shah et al, a study done from same population a decade ago. This may again depict a changing trend in our population where proportion of lobar hemorrhages matches other studies.In addition 10 and 6 patients had bilateral hemorrhages and primary IVH in our study. Multiple spontaneous ICH study is limited to case reports and small case series with high mortality[25].Six out of 10 patients with bilateral hemorrhages died in next 30 days. All had history of hypertension with high SBP at presentation. Around 65% patients developed systemic complications including Electrolyte disturbances and infections. Around 150 had more than one complications. Most common was Hyponatremia (defined as serum sodium less than 135) seen in 44.9% of patients, followed by respiratory complications in 26.1% of patients. Other complications include Acute Renal Failure (N=44), UTI and other infections (N=58) and GI Bleed (N=10). The 30 day mortality in patients with pulmonary complication was 47% against a total of 36%. In their study on 144 patients, Marmaton et al found that 28% developed pulmonary complications which increased morbidity, mortality, and duration of hospital stay[26]. A study from our institute by Saleem et al found 35% prevalence of hyponatremia in stroke patients (both ischemic and hemorrhagic stroke)[27]. A higher cut off value of i,e <135 vs <130 in our study is likely to explain higher proportion of hyponatremia in our study.In a meta-analysis the pooled prevalence rate of AKI after all stroke types was 11.6%. Subgroup analyses revealed that the pooled prevalence rate of AKI after ICH was 12.9%.[28]. In our study 6.2% patients developed acute kidney Injury.Mortality at 30 days in our study was 36.2%.Mortality rate increased with increasing ICH score. We also looked at 30 day mortality as per ICH score originally developed by Hemphill et al and subsequently validated in other populations. Summary Of comparisons is given in Table 4 . Mortality at 30 days as per ICH score was comparable with average of other studies. Mortality rate increased with increasing ICH score. A Jonckheere-Terpstra test for ordered alternatives showed that there was a statistically significant trend of higher mortality at 30 days with higher levels of ICH Score from 0 to 5. (TJT = 101,529, z = 17.914, $p < 0.0001$). Plotting ICH score ROC curves demonstrated an area under the curve of 0.896, compared to 0.92 for the original ICH score cohort (8) and 0.88 for Stanford cohort (11); indicating that the ICH score performed comparably in both groups with regard to outcome risk stratification. From this it can be concluded that ICH score is an accurate predictor of outcome in terms of 30 day mortality in our population.

Conclusion

Intracranial hemorrhage is more frequent than ischemic stroke in our population, although proportion is showing downward trend from last decade. Males are affected more than females. The main cause is still hypertension, although increase in proportion of lobar hemorrhages in last decade in our population may be an indicative of superadded amyloid angiopathy. Basal ganglia followed by thalamus are most commonly affected sites. Pulmonary complications are most common systemic complication. Mortality of around 36.2% is still a concern as not much has changed worldwide. ICH volume, IV extension, GCS, Age ≥ 80, Infratentorial location are strong predictors of mortality. ICH score, which incorporates above variables, is an accurate marker to predict 30 day mortality in our population. Further study should focus applicability of ICH score to predict long term outcome. Control of risk factors especially hypertension at present seems only appropriate measure.

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