

A Study of Systolic, Diastolic Blood Pressure and Non-Invasive Mean Arterial Pressure with Regard to Adverse Events in Acute Hemorrhagic Stroke in A Rural Tertiary Care Hospital

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ABSTRACT

Introduction: Stroke is an important and leading cause of morbidity and mortality worldwide. As hemorrhagic stroke has high degree of morbidity and mortality, and treatment being more with supportive therapy and interventional therapy being beyond the reach of an average Indian, it becomes imperative to identify the risk factors and prevent the event as a primary approach and it becomes important to identify the important prognosticating factors in assessing the morbidity and mortality in acute hemorrhagic strokes. Study aimed to identify an added risk factor at the time of presentation in the form of blood pressure measurement by assessing the systolic blood pressure, the diastolic blood pressure and non-invasive mean arterial blood pressure at the time of presentation to the hospital and also correlated it with the ICH score and estimated whether the blood pressure parameters could be used independently or in addition to the existing ICH scoring system to prognosticate the outcome of the hemorrhagic stroke event during in-hospital stay.

Material and methods: 50 patients who presented to the present medical college with acute hemorrhagic stroke were assessed with their systolic blood pressure, diastolic blood pressure and non-invasive mean arterial pressure. Clinical and imaging factors as per ICH scoring system, namely age, hematoma volume, intra-ventricular hemorrhage, infratentorial origin of hemorrhage and Glasgow - coma scale were also studied.

Results: The systolic, diastolic blood pressure and mean arterial pressure elevation was consistently in correlation with high ICH score which indicated the high degree of mortality in our study. 7 patients (14%) who were below the age of 79 and 11 patients (22%) above the age of 80 died. In our study, we observed that High systolic and diastolic blood pressure were associated with increased ICH score and mortality.

Conclusion: Hence we conclude that along with ICH scoring, the assessment of systolic, diastolic blood pressure and mean arterial pressure on admission to the hospital can be used as an added criterion to assess the short-term mortality in intracerebral hemorrhage.

Keywords: Stroke, Intra Cerebral Hemorrhage (ICH), Hematoma, Systolic Blood Pressure, Diastolic Blood Pressure, Mean Arterial Pressure, Hypertension

showed a prevalence of 147 cases per 100,000 population and an annual incidence of 36 per 100,000 in the year 1998-99. Presently, the stroke fact sheet of 2012 estimates 84-262 per 100,000 in rural and 334 - 424 per 100,000 in urban areas.² In a stroke, the hemorrhagic cause is high in Asian countries because of the high prevalence of hypertension which may have been masked or treated without sufficient control of blood pressure. The estimated percentage of hemorrhagic stroke in the western population is around 10% of all stroke cases, and in India, it is 17.7 - 32% of all strokes.³ As hemorrhagic stroke has high degree of morbidity and mortality, and treatment being more with supportive therapy and interventional therapy being beyond the reach of an average Indian, it becomes imperative to identify the risk factors and prevent the event as a primary approach and it becomes important to identify the important prognosticating factors in assessing the morbidity and mortality in acute hemorrhagic strokes.

It is a well-known factor that systemic hypertension is one of the leading causes of hemorrhagic stroke besides modifiable risk factors like smoking, alcohol, dyslipidemia, diabetes, and drugs like cocaine and methamphetamine also the non-modifiable risk factors like aging, gender distribution, etc.³ The evaluation of these risk factors can help in the prediction of the outcome of a hemorrhagic stroke event. Besides, the ICH score helps in the prediction of assessing the 30-day morbidity and mortality. However systolic, diastolic blood pressure and non-invasive mean arterial pressure are not included in the ICH scoring system.⁴

Hence, we aimed to identify a singular risk factor at the time of presentation in the form of blood pressure measurement by assessing the systolic blood pressure, the diastolic blood pressure and non-invasive mean arterial blood pressure at the time of presentation to the hospital and also correlated it

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INTRODUCTION

Stroke is an important and leading cause of morbidity and mortality worldwide. The consequences of stroke can be severe, leading annually to 5 million deaths and being left permanently disabled.¹ A stroke study conducted in Kolkata

with the ICH score and estimated whether the blood pressure parameters could be used independently or in addition to the existing ICH scoring system to prognosticate the outcome of the hemorrhagic stroke event during in-hospital stay.

Study aimed to study the systolic blood pressure, diastolic blood pressure and non-invasive mean arterial pressure in patients with acute hemorrhagic stroke, to study the site of intracerebral bleed in relation to systolic blood pressure, diastolic blood pressure and mean arterial blood pressure, to study other CNS complications like intra ventricular extension and mass effect through the assessment of these parameters and to correlate these parameters with the ICH scoring system and to see whether these parameters could be independent or complimentary prognostic factors in determining the outcome in cases of acute hemorrhagic stroke.

MATERIAL AND METHODS

We studied a group of 50 patients who presented to our medical college with acute hemorrhagic stroke and assessed their systolic blood pressure, diastolic blood pressure and non-invasive mean arterial pressure. Clinical and imaging factors as per ICH scoring system, namely age, hematoma volume, intra-ventricular hemorrhage, infra tentorial origin of hemorrhage and Glasgow - coma scale we also studied.

Inclusion criteria

Patients in age group of 40 – 85 years with proven CT scan evidence of spontaneous intracerebral hemorrhage were taken for study.

Exclusion Criteria

The following cases were excluded from the study.

1. Tumour bleed
2. History of bleeding diathesis
3. Hemorrhagic infarcts
4. Primary subarachnoid bleeds
5. Traumatic cerebral hemorrhage

All patients included in the study after getting consent, were taken with a detailed history regarding age, sex, occupation, time of occurrence of the event, comorbid factors like pre-existing hypertension, diabetes, dyslipidemia, drug intake including alcohol. The patients were clinically assessed for vital parameters and detailed neurological examination and other systems examination were conducted. Concurrently the patients were also worked up for complete hemogram, coagulation profile, basic biochemical parameters, including random blood sugar and renal / lipid profiles / electrolyte profile, urine albumin / sugar/ deposits, ECG, Chest X-ray, CT scan head and in needed cases collagen vascular disease profile was done.

All these parameters were collected by detailed history as with patients / relatives / attenders as appropriate in a standard hospital approved proforma. Patients were considered as hypertensives if they met the following parameters with history of hypertension, medications for hypertension, presence of hypertensive retinopathy by ophthalmologic examination and with evidence of left

ventricular hypertrophy with ECG, ECHO and cardiomegaly in chest x-ray.

The blood pressure was recorded at the time of admission and it was used for the assessment of systolic blood pressure, diastolic blood pressure and non-invasive mean arterial pressure. The ICH scoring system was done as per protocol.

RESULTS

50 patients, 32 male and 18 female with spontaneous intracerebral hemorrhage in CT images were included in this study. (Table 1) 62% of patients are in 40 to 79 years with less mortality of 14% followed by greater than 80 years are 38% with higher mortality of 22%. (Table 2)

Sex	No. of cases	%	Mortality	%
Male	32	64	10	20
Female	18	36	8	16
Total	50	100	18	36

Table-1: Gender distribution of patients and mortality

Age distribution	No. of cases	%	Mortality	%
40 - 79 years	31	62	7	14
>=80 years	19	38	11	22
Total	50	100	18	36

Table-2: Age distribution of patients and mortality

Systolic blood pressure	No. of cases	%	Mortality	%
< 140	5	10	0	0
141 - 159	13	26	6	12
>160	32	64	12	24
Total	50	100	18	36

Table-3: Systolic blood pressure levels in patients and mortality

Diastolic blood pressure	No. of cases	%	Mortality	%
<90	17	34	0	0
90 -99	4	8	4	8
>100	29	58	14	28
Total	50	100	18	36

Table-4: Diastolic blood pressure levels in patients and mortality

Mean arterial pressure	No. of cases	%	Mortality	%
<140	26	52	5	10
>140	24	48	13	26
Total	50	100	18	36

Table-5: Mean arterial pressure levels in patients and mortality.

Volume of hematoma	No. of cases	%	Mortality	%
<30 cc	12	24	6	12
>30 cc	38	76	12	24
Total	50	100	18	36

Table-6: Volume of Hematoma in patients and mortality

Intraventricular hemorrhage	No. of cases	%	Mortality	%
No	21	42	5	10
Yes	29	48	13	26
Total	50	100	18	36

Table-7: Presence of Intra ventricular hemorrhage in patients and mortality

Infratentorial origin	No. of cases	%	Mortality	%
No	3	6	2	4
Yes	47	94	16	32
Total	50	100	18	36

Table-8: Presence of Infratentorial origin in patients and mortality

ICH parameter	Score	No. of cases	%	Mortality	%
Age	0	31	62	7	14
	1	19	38	11	22
Volume of hematoma	0	12	24	6	12
	1	38	76	12	24
IVH	0	21	42	5	10
	1	29	58	13	26
IFO	0	3	6	2	4
	1	47	94	16	32
GCS	0	18	36	0	0
	1	14	28	4	8
	2	18	36	14	28

Table-9: ICH scoring done for patients and mortality

32 patients had systolic pressure greater than 160mmHg. 29 patients had diastolic pressure greater than 100mmHg. (Table 3 and 4) 24 patients had mean arterial pressure greater than 140. (Table 5) 44% of patients were already on hypertensive medicines. 26 patients were noted with chronic hypertensive changes through ECG, Chest X-ray, Echo and with fundoscopic findings. 12 patients had volume of less than 30cc and 18 patients had greater than 30cc. (Table 6) 29 cases were found with intraventricular hemorrhage. (table 7) 47 cases were found with infratentorial hemorrhage. (Table 8) Distribution ICH score with study parameters were shown in the table 9.

DISCUSSION

Hypertensive ICH usually results from spontaneous rupture of a small penetrating artery deep in the brain. The most common sites are the basal ganglia (especially the putamen), thalamus, cerebellum, and pons. The small arteries in these areas are more prone to hypertension-induced vascular injury. The resultant hemorrhage may be small, or a large clot may form and compress adjacent tissue and cost herniation and death. Blood may also dissect into the ventricular space which substantially increases the mortality.³ Most hypertensive intracerebral hemorrhages initially develop over 30 to 90 minutes. However, it is now recognized that about a third of patients even in the absence

of offending drugs and anticoagulants may have significant hematoma expansion for the first 24 hours. It is to be noted that about 30-45% of all the ICH patients perish within the first month.³ The primary risk factor, being hypertension which forms around 14 - 34% of mortality risk factor amidst intracerebral hemorrhages. In our study, we found that 22 patients (44%) had a history of hypertension and were on medications. 26 patients (56%) were identified with chronic hypertensive changes through ECG, Chest X-ray, Echo and with fundoscopic findings. 2 patients (4%) did not have the history of hypertension or any hypertensive changes at the time of admission. Age is a strong risk factor for intracerebral hemorrhages, and it also affects the body in numerous ways, including changes to the cardiovascular and central nervous systems that interplay with multiple risk factors. Advanced age is associated with worse clinical outcomes in many conditions. As a result, it may confound the attributable risk of age with regards to the odds of having an ICH and its outcome and contributes a lot towards the mortality of the patients.⁵ In this study, 7 patients (14%) who were below the age of 79 and 11 patients (22%) above the age of 80 died. The total mortality was 36% in our study. The male population is more susceptible to develop ICH than females at all ages other than 80-year-old age group.⁶ The same was observed in our study too with 64% male patients out of which 20% mortality was observed in them and out of 18 female patients (36%) the mortality was 8 (16%). The study by Qureshi et al. has concluded that the higher systolic blood pressure in intracerebral hemorrhage had a significant mortality rate in spite of trying to achieve optimal systolic blood pressure as per standard protocol.⁷ In our study we observed the same with 12 out of 32 patients who had systolic blood pressure > 160 mm Hg were fatal with the mortality rate of 37.5%. In our study, we observed that High systolic and diastolic blood pressure were associated with increased ICH score and mortality. In a study done by Fogelholm R et al., it was found that 62% of patients had the MAP of >140mmHg had higher mortality which was consistently observed in our study also with 13 out of 24 patients with high MAP had fatal results.⁸ In our study, we observed that the volume of hematoma >30cc was associated with high degree of mortality 12 out of 38 patients (24%) which correlated with the Broderick et al. study.⁹

In our study, we found that patients with intraventricular hemorrhage had a higher incidence of mortality 13 out of 29 patients 44% which was consistent with Hinson HE et al. study.¹⁰ In our study, we found that infratentorial hemorrhage had a high degree of mortality as compared with Yang W et al.¹¹ We also found that the ICH score directly correlated with the admission systolic BP, diastolic BP and mean arterial pressure which was recorded at the time of admission.

CONCLUSION

The major risk factor for intracerebral hemorrhage was identified to be hypertension. The masked factor in the development of ICH stroke seems to be hypertension which was unidentified till the point of admission in the hospital

at the time of ICH. Hence, more vigilant and diligent surveillance for hypertension needs to be done at the social level as a preventive factor. The ICH scoring correlated well with the assessment of mortality in our study. The systolic, diastolic blood pressure and mean arterial pressure elevation was consistently in correlation with high ICH score which indicated the high degree of mortality in our study. Hence we conclude that along with ICH scoring, the assessment of systolic, diastolic blood pressure and mean arterial pressure on admission to the hospital can be used as an added criterion to assess the short-term mortality in intracerebral hemorrhage.

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