

Current practices in the management of patients with spontaneous intracerebral hemorrhage at the National Hospital of Sri Lanka – A clinical audit

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(Key words: spontaneous ICH, blood pressure, prophylactic antiepileptic, INTERACT2, AHA/ASA guideline)

Abstract

Background and objectives: Spontaneous, non-traumatic intracerebral hemorrhages (ICH) is the second most common cause of stroke after acute ischemia. However, it causes significant mortality and morbidity and has comparatively worse outcomes. Most studies show that ICH when treated with good medical care has lower mortality. Our primary aim was to evaluate how ICH is currently managed at the National hospital of Sri Lanka (NHSL), the premier tertiary care hospital in the country, whilst identifying strengths, weaknesses and deficiencies. We plan to develop a comprehensive management protocol for ICH patients and to re-evaluate the treatment practices after applying them. NHSL is a research centre for the international, multicenter INTERACT2 trial, which emphasizes intensive blood pressure, blood sugar and temperature control and managing coagulopathy in ICH leading to better outcomes. We are recruiting new ICH cases to this trial.

Methodology: The prospective standard audit was conducted at NHSL for a period of 3 months and the study population consisted of 76 patients with spontaneous ICH. The 2015 AHA/ASA guideline for the management of spontaneous intracerebral hemorrhage was used as the standard guide for the management.

Results: Of 76 patients with ICH 46 (60.5%) were males and mean age was 61.3±12.6 years. The blood pressure (BP) and blood sugar control was achieved only in 51.3% (39) and 15.8% (12) respectively. Although prophylactic anti-epileptics are not recommended in ICH almost 70% were started on them, in spite of only 15.8% having overt convulsions. Steroids though not recommended to lower intracranial pressure in ICH 51%

were on them. Of those ICH admitted to medical and neurology wards 81% were referred to neurosurgery irrespective of the location and the nature of the bleed and when not indicated (based on AHA/ASA guidelines) delaying and interfering with optimal medical care.

Conclusions: Several deficiencies were identified in the current management routines of ICH at NHSL including delayed, sub-optimal medical care, unnecessary widespread use of AEDs and steroids. Majority of neurosurgical referrals too were unnecessary and not indicated.

Key messages:

- Spontaneous ICH is best managed medically in the majority.
- Optimizing blood pressure, blood sugar and temperature control with rational management of coagulopathy improves outcomes.
- Unnecessary, unwarranted surgical referrals could delay medical management.
- Neurosurgical intervention could be essential in a few selected cases, especially involving the posterior fossa.
- Irrational use of antiepileptic drugs and use of steroids to lower ICP may be harmful.
- It is best to monitor intracranial pressure (ICP) and control rationally.

Introduction

Stroke is one of the main causes of disability and death worldwide. About 15 million people suffer from

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stroke each year according to the world health organization out of which 5 million die and another 5 million are permanently disabled [1]. The prevalence of stroke is 10.4 per 1000 population in urban Sri Lanka and data on the whole population is sparse [2]. Annual incidence of stroke ranges from 76 -119 per 100,000 population [2] and the burden of stroke now has risen to 61 million disability adjusted life years (DALYs) compared to 38 million in 1990 [3].

Spontaneous, non-traumatic ICH is the second most common cause of stroke accounting for 15% of all strokes. Multiple causative factors like hypertension, vascular malformations, vasculitis, amyloid angiopathy, moyamoya disease, bleeding disorders, ruptured saccular aneurysm and drugs like cocaine and amphetamines are implicated in ICH. Many studies relating to interventions in ICH have been published in the past few decades. Most point out that it is a survivable disease with a good outcome if properly treated medically [4]. Surgical interventions are needed only in a small percentage of selected cases. The latest guidelines published in 2015 by the American Heart Association and American Stroke Associations (AHA/ASA) is being used as the bench mark guide for ICH management.

Main purpose of our audit is to evaluate the steps in the acute management of spontaneous ICH including blood pressure and sugar control, managing coagulopathies, seizures and raised intracranial pressure (ICP). Furthermore, to evaluate the utility of neurosurgical teams in its acute management.

Methods

The study was conducted at National Hospital of Sri Lanka for a period of 3 months. All patients who presented with spontaneous ICH were included and patients who were less than 18 years of age, traumatic ICH, coexisting subarachnoid hemorrhages and ischemic strokes with hemorrhagic transformation were excluded. All data were

collected using bed head tickets, previous medical records and computed tomography imaging and interviewer administered questionnaires filled by a single medical officer in neurology. Data was analyzed using Microsoft Office Excel and SPSS.

Results

The study population consisted of 76 patients. The demographic characteristics and important risk factors are summarized in the Table 2. Mean age of onset of spontaneous ICH in the study group is 61.3+12.6 and 60.5% of the patients were males indicating its high prevalence amongst the male population. Hypertension, diabetes, hypercholesterolemia, and ischemic heart disease are common in the study population with a prevalence of 80.2%, 75%, 72.4% and 57.9% respectively. 71.1% of the population used alcohol and 55.3% used tobacco.

The characteristics of ICH including the location, associated intraventricular hemorrhage, etiology and ICH score to assess severity are listed in Table 3.

Most of the spontaneous ICHs were due to hypertension (75%). During the period of admission 80.2% (61) of patients had high blood pressure (SBP of more than 140 mmHg) and control was achieved before discharge only in 51.3%. The desired blood sugar target of 140-180mg/dl was reached only in 15.8%. Only 7 patients in the study group had coagulation abnormality mainly related to high PT/INR. 66.6% of the patients who had no coagulation abnormality received either intravenous vitamin K, platelets or tranexamic acid which are not currently recommended in ASA/AHA guideline. 15.8% (12) patients had seizures during the admission and treated with antiepileptic medications. Among 64 patients who haven't had overt seizures, 37 patients treated with prophylactic antiepileptics and none of them underwent EEG.

Table 1. Audit criteria/standards

<i>Criteria</i>	
Blood pressure management	Control of systolic blood pressure to <140mmHg if elevated before discharge
Correction of coagulation	Correct anticoagulation abnormality if present
Blood sugar control	Maintaining normoglycemia (140-180mg/dl)
Seizure control	Avoiding prophylactic antiseizures drugs and proper use of antiseizure drugs
Raised ICP management	Timely ICP monitoring, Use of Mannitol and Hypertonic saline
Surgical management	Surgical referral only for patients with cerebellar hemorrhages, brainstem hemorrhages with or without hydrocephalus and neurological deterioration

Table 2. Demographic characteristics and risk factors of the study population

		<i>Number of patients</i>	<i>Percentage (%)</i>
		Mean age 61.3+- 12.6	
Age	Male	46	60.5
Gender	Female	30	39.5
Body mass index (BMI)	Less than 18	13	17.1
	19 - 23	22	28.9
	24 - 30	33	43.4
More than 31	8	10.6	
Ethnicity	Sinhalese	41	53.9
	Tamil	14	18.4
	Muslims	17	22.5
	Burgher	2	2.6
	Other	2	2.6
Hypertension	No	15	19.8
	Yes	61	80.2
Hypercholesterolemia	No	21	27.6
	Yes	55	72.4
Diabetes mellitus	No	19	25
	Yes	57	75
Ischemic heart disease	No	32	42.1
	Yes	44	57.9
Antiplatelet use	No	27	35.5
	Yes	49	64.5
Anticoagulation use	No	69	90.8
	Yes	7	9.2
Tobacco use	No	34	44.7
	Yes	42	55.3
Alcohol use	No	22	28.9
	Yes	54	71.1

Table 3. ICH characteristics

		<i>Number of patients</i>	<i>Percentage (%)</i>
Location of ICH	Basal ganglia	7	9.2
	Internal capsule	39	51.3
	External capsule	2	2.6
	Thalamus	9	11.8
	Lobar	12	15.7
	Cerebeller /infratentorial	7	9.2
Presence of coexisting intraventricular hemorrhage	Yes	19	25
	No	57	75
Etiology	Hypertension	57	75
	Bleeding disorders	5	6.5
	Anticoagulation related	7	9.2
	Cerebral amyloid angiopathy	3	3.9
	Cerebral venous sinus thrombosis	2	2.6
	Other	2	2.6
ICH score	0	11	14.5
	1	22	28.9
	2	13	17.1
	3	15	19.8
	4	13	17.1
	5	2	2.6
	6	0	0

Intravenous glucocorticoids were given to 39 (51%) patients with spontaneous ICH to control raising intracranial pressure. The other patients were managed with either head end elevation, intravenous mannitol or intravenous hypertonic saline alone or in combination. Among 76 total patients 48 were in medical wards, 15 and 13 were in neurology and neurosurgery wards respectively. Out of 63 patients who were in neurology or medical wards 41 patients have been referred to neurosurgery. Percentage of neurosurgical referrals from medical wards were 81.3% and 82.1% of them were unnecessary referrals.

Discussion

Spontaneous ICH is one of the commonest causes of mortality and morbidity in Sri Lanka. It should be essentially managed medically, with good blood pressure, blood sugar, temperature control along with the management of coagulopathy and raised ICP. Surgery is only indicated in a few selected cases. At NHSL, ICH patients get admitted to neurology, neurosurgery or general medicine. However, lack of awareness and comprehensive treatment protocols lead to unsatisfactory outcomes, with higher morbidity and mortality. A prompt and an accurate diagnosis of ICH is usually made at NHSL but proper optimal medical management is lacking. This could be due to poor awareness and overenthusiastic neuro surgical referrals mostly in the unindicated cases. The ASA/AHA 2015 guideline elaborates the important steps in the management of spontaneous ICH and it is used as the standard practice in this audit. Currently no management protocols of ICH exists at NHSL.

Elevated systolic blood pressure (SBP) is associated with greater hematoma expansion, neurological deterioration, death and dependency [5]. Hence, acute lowering of SBP to 140 mmHg within 1 hour for the SBP between 140-220 mmHg is safe for clinically stable patients. The SBP of more than 220 mmHg, should be reduced to less than 220 mmHg rapidly and thereafter gradually to reach the target of 140-160mmHg. INTERACT2 trail emphasizes that intensive blood pressure lowering was

associated with improvement of disability scores [6]. In the audit 80.2% had systolic blood pressure of more than 140 mmHg during initial period. However, only 51.3% of the patients achieved the target control of blood pressure before discharge from the hospital, hence unsatisfactory.

Patients with severe coagulation factor deficiencies should obtain appropriate factor replacement therapy and patients with severe thrombocytopenia should receive platelets. However, there is no place for platelet transfusion for patients with normal platelet count and tranexamic acid or vitamin K for the patients with normal coagulation. Out of 76 study population only 7 had abnormal coagulation parameters. However, except for 23 patients all other patients with normal coagulation parameters received either vitamin K, Tranexamic acid or platelets. Platelet transfusion is not indicated unless there is thrombocytopenia, 2 patients with normal platelets received platelet transfusion which is not recommended.

The recommended blood sugar of 140 to 180 mg/dl was reached by 15.8%. There is 16% risk of seizures within first week [7]. Only clinically overt seizures should be treated with antiepileptic drugs. However in cases with altered sensorium and EEG evidence of seizures antiepileptic drugs can be considering due to the possibility of non-convulsive seizures. 39 (51.3%) received AEDs but only 12 (15.8%) had clinical seizures in this study. Some studies found that prophylactic antiseizure medications were associated with worse outcomes [8,9].

Acute elevation of intracranial pressure (ICP) and mass effect can be effectively treated either with hypertonic saline or Mannitol. If the pharmacological measures fail, Phenobarbital or Propofol, induction of hyperventilation and neuromuscular blockade can be attempted. None of our patients had intracranial pressure monitoring during admission. However, all patients received preventive measures for raised intracranial pressure including head end elevation, intravenous Mannitol or hypertonic saline alone or in combination. Though not recommended over 50% were given steroids to reduce ICP.

Table 4. Percentage of patients who achieved audit standards

<i>Audit criteria/standards</i>	<i>Percentage of patients</i>
Control of systolic blood pressure to <140mmHg if elevated before discharge	51.3%
Correct anticoagulation abnormality if present	9.2%
Maintaining normoglycemia (140-180mg/dl)	15.8%
Avoiding prophylactic antiseizures drugs and proper use of antiseizure drugs after EEG	30.8%
Timely ICP monitoring, Use of Mannitol and Hypertonic saline	100%
Surgical referral only for patients with cerebellar hemorrhages, brainstem hemorrhages with or without hydrocephalus and neurological deterioration	19.7%

The role of surgery for most patients with spontaneous ICH remains controversial [10,11]. In cerebellar ICH surgical removal of the hemorrhage as early as possible may be indicated. Also in brainstem compression with or without hydrocephalus surgery may be needed [12]. The benefit of surgical clot removal for supratentorial ICH is not well established. Only 19.7% of patients were referred to neurosurgery as recommended due to cerebellar hemorrhages, brainstem hemorrhages with or without hydrocephalus and neurological deterioration. Other patients were referred due to other indications including seizures, transfer to local hospital, reduce GCS (Glasgow Coma Scale) and family request. These data indicates that most of the neurosurgical referrals were unnecessary.

This audit emphasizes the deficiencies in the management of spontaneous ICH in a tertiary care hospital setting in Sri Lanka. The target audit standards were not achieved in most aspects of management. Hence this audit highlights the importance of awareness and administering proper medical care in cases of ICH and also the importance of using neurosurgical teams only if and when there is a specific indication to evacuate the clot. Currently, we are in the treatment arm of INTERACT study which will further facilitate to achieve best medical care for ICH patients.

Conclusion

Management of spontaneous ICH in Sri Lanka is challenging. As indicated above only a small proportion of ICH patients achieved audit standards. This lead to severe morbidity and mortality which in turn adds to the national health burden. Onwce the above parameters are rectified we plan to re-audit ICH management at NHSL.

Author contribution

(1) Research project: A. Conception, B. Organization, C. Execution; (2) Statistical Analysis: A. Design, B. Execution, C. Review and Critique; (3) Manuscript: A. Writing of the First Draft, B. Review and Critique.

IR: 1A, 1B, 1C, 2A, 2B, 3A

TW: 1B, 1C, 3B

CM: 1C, 3B

RS: 1C, 3B

BS: 1A, 1B, 1C, 2C, 3B

Competing interests

The authors have no competing interests.

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Ethics approval and consent to participate

The ethical approval obtained from the Ethical Review Committee (ERC), National Hospital of Sri Lanka

and a copy of approval letter is available for review. The informed written consent obtained from all eligible participants and copies of written consents are available for review.

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