



Predictors of unfavourable outcome following surgical evacuation of hypertensive lobar and putaminal intracranial hemorrhage

Subash Lohani^{1*}

Asha Sharma¹

Dinesh Nath Gangol¹

Upendra Devkota¹

¹Department of Neurosurgery,
National Institute of Neurological and
Allied Sciences, Kathmandu, Nepal

ABSTRACT

Background: Intracerebral haemorrhage (ICH) is the second most common cause of stroke with a high case of fatality rate. Even with recent advances in the neuro-intensive care, no specific treatment has been shown to improve outcomes and treatment is mainly supportive. In this context we wanted to evaluate the predictors of unfavourable outcome after surgical evacuation of hypertensive supratentorial intracerebral haemorrhage.

Materials and methods: This is a retrospective study of patients who underwent craniotomy for evacuation of putaminal or lobar hypertensive haemorrhage. Extended Glasgow Outcome Scale (GOSE) at six months is the primary outcome measure and length of hospital stay is the secondary outcome measure.

Results: There were a total of 48 patients who were operated for supratentorial hypertensive haemorrhage over the period of two and a half years. Mean age of the patient was 51.34 years. Nineteen of them were lobar haemorrhage while 29 were putaminal. Average duration since event till surgery was 29.46 hours. Mean GCS on arrival was 9.56. Mean length of hospital stay was 25.88 days. Mean GOSE at six months was 4.06. Overall mortality at six months was 25.8%. Putaminal haemorrhage was significantly associated with unfavourable GOSE ($p=0.004$). Duration of event prior to surgery did not appear to play any significant role in the prediction of outcome. Mean age of patients with favourable GOSE at six months was 43.25 versus 55.83 among patients with unfavourable GOSE ($p=0.029$). Mean GCS at presentation of patients with favourable GOSE at six months was 12.18 vs 8.47 among patients with unfavourable GOSE ($p=0.008$).

Conclusion: GCS on arrival and age of the patient is significantly related to the outcome after surgical evacuation of hypertensive supratentorial ICH. Putaminal haemorrhage has significantly higher unfavourable outcome. There is no difference in early versus late surgical intervention in hypertensive supratentorial ICH.

Keywords: Predictors; Hypertension; Hemorrhage; Putaminal

***Correspondence:** Dr Subash Lohani; Department of Neurosurgery; National Institute of Neurological and Allied Sciences

Tel.: +977-1-4373850

Email: subash.lohani@gmail.com

INTRODUCTION

Stroke is the leading cause of death worldwide and one of the leading causes of disability.^[1] Intracerebral haemorrhage (ICH) is the second most common cause of stroke and has a high case fatality rate. Overall incidence of hemorrhagic stroke is 24.6 per 100000 person per year with median case fatality of 40.4% at one month. Regarding the functional outcome, independency rates varies among various studies between 12% and 39%.^[2,4] The overall incidence of ICH in Asian population is almost twice than in other ethnic groups.^[1]

Even with recent advances in the neuro-intensive care, ICH still has high morbidity and mortality. No specific treatment has been shown to improve outcomes, and treatment is mainly supportive.^[5] The International Surgical Trial in Intracerebral Haemorrhage (STICH), is still the largest, the most recent and influential study on ICH. It randomised 1033 patients to either early haematoma evacuation or best medical treatment. No differences were detected in survival or functional outcomes between the two groups. In subgroup analysis, patients with haematomas that is one cm or less from the cortical surface seemed to benefit from early surgery.^[6] Although STICH trial did not demonstrate any benefit of early surgery in patients with intracerebral haemorrhage but surgical evacuation of a haematoma is still carried out in life threatening haematomas with midline shift, and poor GCS. In this context, we wanted to evaluate the predictors of unfavourable outcome after surgical evacuation of hypertensive supratentorial ICH.

MATERIALS AND METHODS

Study design: This is a retrospective case series.

Duration: The study was conducted over a period of two and a half years from January 2014 to June 2016.

Sample size: All patients who underwent craniotomy and evacuation of haematoma at the National Institute of Neurological and Allied Sciences for supratentorial ICH over the study period were included.

Methods: Neurosurgery operation theatre register was used to gather the list of patients. Their chart were reviewed to collect data on variables like age, sex, GCS at presentation, location of bleed, time of event, time of presentation, time of surgery, and length of hospital stay.

Operative treatment: Surgical evacuation of hematoma was considered for hematoma size more than 30 ml with GCS motor score localizing or poor and more than 50 ml even with normal GCS score. All putaminal bleeds were removed through transfrontal-transsulcal approach for concerns over relative operative difficulty in transsylvial approach. Frontal box flap incision was marked with posterior limb along the coronal suture. After elevating the bone flap, dura was opened based on the sinus. Frontal cortex in front of the coronal suture was selected to target the haematoma cavity. Haematoma was evacuated with gentle suction and irrigation. Haematoma cavity was then lined with surgical to secure haemostasis. Dura was closed and the bone flap was replaced. Drain was placed and the wound was closed. Post-operatively patient was managed in the intensive care unit with aggressive control of blood pressure using oral antihypertensives, intravenous labetalol (bolus or infusion) and GTN as required.

Primary outcome measure: Extended Glasgow Outcome Scale (GOSE) at six months was used as the primary outcome measure.^[7] GOSE was estimated based on the telephone interview with the patient's caretaker. GOSE of four or less was considered as unfavourable. GOSE of five or more was considered as favourable.

Secondary outcome measure: Length of hospital stay was used as the secondary outcome measure.

Analysis: SPSS version 20 was used for data analysis. Chi-square test and Fisher's exact test was used to see the association of variables such as age, sex, GCS, location of bleed and duration prior to surgery with primary outcome divided dichotomously as favourable and unfavourable. Same variables were also tested using GOSE as continuous variable using independent samples t-test. Similar tests were repeated for secondary

outcome measure as well. P value of 0.05 or less was considered to be significant.

RESULTS

There were a total of 48 patients who were operated for supratentorial hypertensive haemorrhage over this period. Nine of them were females while the rest 39 were males with male: female ratio of 4.3:1. Mean age of the patient was 51.34 years (range 40 to 72 years). Nineteen of them were lobar haemorrhage while 29 were putaminal. All operated haematomas were larger than 30 ml in volume. Putaminal haemorrhage was evacuated via transfrontal route while the rest of the lobar haematoma were evacuated with corresponding site craniotomy. Average duration since event till surgery was 29.46 hours (range 1 hour to 96 hours). Mean GCS on arrival was 9.56 (range 3 to 15). Mean length of hospital stay was 25.88 days (range 1 day to 108 days). Only 31 patients were available for telephone interview to assess their GOSE. Mean GOSE was 4.06 (range 1 to 8). Overall mortality at six months was 25.8%. Overall unfavourable outcome was 58.06% inclusive of GOSE 1. Overall favourable outcome was 41.94%.

Table 1. Assessment of the predictors of GOSE after hypertensive supratentorial haemorrhage

		Favourable GOSE		P-value
		Yes	No	
Operation ^a	In <24 h	6	6	0.203
	After >24 h	9	6	
Operation ^b	In <12 h	4	3	0.364
	After >12 h	8	12	
Gender ^b	Male	10	16	0.531
	Female	2	2	
Haemorrhage ^a	Putaminal	3	14	0.004
	Lobar	9	4	

GOSE: Extended Glasgow outcome scale; ^aContinuity Correction χ^2 -test; ^bFischer's exact χ^2 -test

Putaminal haemorrhage was significantly associated with unfavourable GOSE. Duration of event prior to surgery did not appear to play any significant role in the prediction of outcome (Table 1).

Table 2. Correlation of age and GCS at presentation with the length of hospital stay

Characteristics	Hospital stay (mean=25.89 days)	
	r	p-value
Age (mean=51.35 years)	-0.212	0.163
GCS (mean=9.57)	-0.103	0.505

GCS: Glasgow outcome scale

Mean age of patients with favourable GOSE at six months was 43.25 versus 55.83 among patients with unfavourable GOSE. Mean GCS at presentation of patients with favourable GOSE at six months was 12.18 versus 8.47 among patients with unfavourable GOSE. There was no significant correlation between age or GCS at presentation with length of hospital stay (Table 2). Similarly, there was no difference in means of length of hospital stay among patients operated at different times or among patients with different sites of bleeding (Table 3).

DISCUSSION

Spontaneous ICH results from the bursting of small intracerebral arteries, most commonly because of increased susceptibility to rupture caused by chronic vasculopathy. Long-standing high blood pressure commonly leads to lipohyalinosis of tiny perforating arteries serving the thalamus, basal ganglia, and pons, causing deep haemorrhages that often extend into the ventricles.^[8]

The International Surgical Trial in Intracerebral Haemorrhage (STICH) did not show benefit on mortality or six-month functional outcome of policy of early haematoma evacuation of supratentorial ICH.^[6] STICH II studied early haematoma evacuation

Table 3. Results of independent samples t-test for comparison of means

Characteristics	N	GOSE		Age		GCS		Hospital stay	
		mean	P-value	mean	P-value	mean	P-value	mean	P-value
Operation	In <24 h	12	4.67	-	-	-	-	29.67	0.469
	After >24 h	15	3.93	-	-	-	-	23.59	
Operation	In <12 h	7	5	-	-	-	-	40.83	0.089
	After >12 h	20	4	-	-	-	-	22.71	
Gender	Male	26	3.92	-	-	-	-	-	0.459
	Female	4	5	-	-	-	-	-	
Haemorrhage	Putaminal	17	2.82	-	-	-	-	26.05	0.957
	Lobar	13	5.69	-	-	-	-	25.65	
GOSE	Favourable	12	-	43.25	-	12.18	-	-	0.029*
	Unfavourable	18	-	55.83	-	8.47	0.008*	-	

GCS: Glasgow coma scale; GOSE: Extended Glasgow outcome scale; *Significant at p<0.05

in a subset of patients with lobar ICH, haematoma volumes 10 to 100 mL, and without IVH. The trial showed no overall significant difference in combined death or disability compared with initial conservative treatment, although a subgroup of patients with an initial poor prognosis may have been benefitted.^[9] In par with STICH trial surgical treatment of ICH did not confer any definite advantage over conservative treatment in the study by Juvela et al.^[10] Zuccarello et al studied early surgical intervention versus medical management. Patients were operated at about eight hours from the event but considering GOS more than 3 as a good outcome, there was no significant difference in mortality between the two groups at three months.^[11] On the other hand, meta-analysis by Fernandes et al actually suggests some benefit from surgery, with a reduction in the chances of death and dependency after surgical treatment by a factor of 0.63 (OR 0.63| 95% CI 0.35 to 1.14).^[2] Kaneko et al studied the effect of ultra-early surgical evacuation of hypertensive haemorrhage. In all 100 cases haematoma was evacuated within seven hours. Functional outcomes at six months postoperatively were as follows: 15 patients had returned to a full social life, 35 were capable of

self-care at home (that is 50% favourable outcome), 33 required partial care at home, two were bedridden and in a vegetative state, and seven had died.^[12] But there were no control in their study to propound the benefit of surgery. Our patients were operated at a mean of 29 hours and only 40% had favourable outcome. A prospective randomised study of craniotomy and early haematoma removal versus best medical management was performed in 108 patients with primary supratentorial ICH. Surgical or medical treatment was initiated within 8 hours post ictus. Outcomes were assessed at one year post ictus. Analysis of outcome revealed a significantly higher percentage of GOS scores higher than three for the surgical patients, compared with those of the conservative group (33% and 9%, respectively; P< 0.05). By contrast, the mortality rates between operated and conservatively managed patients did not differ significantly. The main prognostic variables were the initial neurologic status, haematoma volume and location as was noted in our series.^[13] Bhatia et al prospectively studied outcome in patients with intracerebral haemorrhage; both supra and infratentorial and 44.6% of their

cohort underwent neurosurgical intervention. In-hospital mortality was 32.7%. Low GCS, higher baseline haematoma volume, intraventricular extension and need for ventilatory assistance were independent predictors of mortality. Surgery did not improve the mortality or outcome.^[14] Mortality in our series was slightly lower. Low GCS was a significant predictor of unfavourable outcome in our series too.

Hu et al did a case control study of 273 patients with hypertensive ICH, divided into death and survival group. Age, haematoma volume, GCS score and systolic blood pressure at admission were independently associated with early death, which is in par with our study.^[15] Overall hospital mortality of 24.4% at a mean duration of 10 days from admission is similarly reflected in our study, but a higher mortality of 42% has been reported by Juvela et al.^[10,16]

Ghani et al studied 36 patients with spontaneous ICH, all of whom underwent haematoma evacuation. 86% of the patients had unfavourable outcome (GOS 1-3) while only 14% of them had favourable outcome (GOS 4-5) at six months of follow up. Multivariate analysis identified midline shift as the single significant independent predictor of functional outcome (p=0.013).^[17] GOSE at six month in our series was much better compared to this series.

This study is limited by small sample size and its retrospective nature. Further multicentre prospective studies are necessary to confirm the results of the current study and to establish practice changing conclusions.

CONCLUSION

GCS on arrival and age of the patient is significantly related to the outcome after surgical evacuation of hypertensive ICH with lower GCS and higher age having unfavourable outcome. Putaminal haemorrhage has significant unfavourable outcome compared to lobar hemorrhage. With a mean operating interval of 29 hours, there is no difference between early versus late surgical evacuation of hypertensive haematoma.

COMPETING INTEREST

The authors declare that there are no competing interests regarding the publication of this paper.

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