Outcome of Surgical Management of Hemorrhagic Stroke Patients in Chittagong, Bangladesh – A Retrospective Study

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Abstract

Background: Primary (Spontaneous) intracerebral hemorrhage (ICH) is a common entity. Surgical techniques are diverse, from the open large craniotomy, to the minimally invasive techniques like stereotactic aspiration of the hematoma, endoscopic evacuation and stereotactic catheter drainage after instillation of thrombolytic agents. Although surgical technique has been improved in recent time the prognosis for patients suffering from ICH still remains poor.

Objectives: The aim of this study was to analyze outcome of Open Craniotomy and Evacuation of the Hematoma in ICH in Chittagong city of Bangladesh.

Methods: We retrospectively reviewed ninety six patients age between 20-80 years with baseline GCS 4-10 or rapidly deteriorating GCS, Blood volume >50ml in supratentorial compartment with midline shifting or >10ml in infratentorial compartment with or without hydrocephalous who underwent craniotomy and evacuation from July 2013 to December 2016 in Government and Private Hospitals of Chittagong city of Bangladesh. Parameters investigated included clinical presentations, radiologic profile, time interval from ictus to surgery, and Glasgow Outcome Scale (GOS) score at 6 months.

Results: The patients mean age was 50 years (range 20-80 years), the mean Glasgow Coma Scale (GCS) score was 7 (range 5–13), the mean ICH volume was 55 ml (range 50–65 ml), and the mean midline shift was 9.52 mm (range 6-14 mm) for the supratentorial cases. The outcome after 6 months was appreciated as favorable (GOS score 4-5) in 63 (66.32%) cases and poor (GOS score 1-3) in 32 (33.68%) cases including 20 (21.5%) deaths.

Conclusion: Our results suggested that craniotomy with hematoma evacuation might be a useful surgical procedure for selected patients of ICH and is feasible and may also be safe. There were no deaths related directly to surgery.

Key words: Spontaneous Intracerebral hemorrhage, GCS, GOS, Craniotomy and evacuation, Chittagong.


Introduction:

Spontaneous Intracerebral Haemorrhage (ICH) is defined as bleeding into brain parenchyma without accompanying trauma. ICH is usually caused by rupture of small penetrating arteries secondary to hypertensive changes or other vascular abnormalities.¹⁻³ In developed countries, the incidence of hypertensive ICH has decreased with the improvement of blood pressure control.⁴ However, in developing countries, the burden of ICH has not decreased.⁵ The outcome of ICH is variable, depending on hematoma volume, location, extension to ventricles, and other factors.⁶ However, compared to ischemic stroke, ICH leads to higher mortality and more severe disability.⁷ The incidence of ICH is substantially variable across countries and ethnicities. ICH accounts for approximately 10-20% of all strokes⁸,⁹ 8-15% in

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western countries like USA, UK and Australia. In low- and middle-income countries the incidence were twice the rates in high-income countries in 2000-2008. In a systematic review of 36 population-based epidemiological studies, the incidence rate of ICH per 100,000 person-years was 51.8 in Asians. It is the leading cause of neurological deficit and third leading cause of death behind Cancer and Heart diseases. A case fatality rate of ICH is approximately 40% at 1 month and 54% at 1 year. Only 12% to 39% of patients achieve long term functional independence. A meta-analysis of ICH outcomes between 1980 and 2008 showed no appreciable change in case fatality rate over that time period, but retrospective studies of large cohorts in the United Kingdom and United States showed a significant decrease in case fatality since 2000. A worldwide stroke epidemiology study revealed that early stroke case fatality (21-day to 1-month) varied substantially among countries and study periods; the case fatality rate was 25-30% in high-income countries while it was 30-48% in low- to middle-income countries. Decrease in the ICH fatality rate might be attributed to the improvement of critical care.

An ICH is an extreme medical emergency that requires immediate treatment. A neurosurgeon with advanced training and years of experience with acute stroke and other cerebrovascular conditions will evaluate a patient to determine whether surgery is the best course of treatment. That decision will depend on the age and overall health of the patient, the degree of brain damage and neurological deficit that has already occurred, and the location of the hemorrhage and hematoma.

Preliminary data from surgical trials indicate that surgery may be helpful in ICH. To date, this premise remains unproven. Ongoing trials are attempting to determine the potential for surgical efficacy for limited craniotomy and image guide minimally invasive surgical removal using thrombolysis or endoscopic evacuation. Preliminary results seem promising. As a low to middle income country advance surgical techniques are not readily available or practiced in Bangladesh except some centers. Majority of the cases are managed by craniotomy and hematoma evacuation. The aim of the present study is to assess the surgical outcome of ICH in Chittagong city of Bangladesh.

Methods:
This study is a retrospective review of 95 patients who underwent a craniotomy and evacuation of hematoma at different government and ICU supported Private Hospitals of Chittagong city of Bangladesh between July 2013 to December 2016. The inclusion criteria were age between 20-80 years with baseline GCS 4-10 or rapidly deteriorating GCS, blood volume >50ml in supratentorial compartment with midline shifting or >10ml in infratentorial compartment with or without HCP. Patients with co-morbid conditions like COPD, Malignancy, GCS 3 or GCS >12, Spontaneous ICH with massive SAH, pregnancy with 3rd trimester, tumour haemorrhage and coagulopathies were excluded. All base line investigations and CT scan of Head (plain) were available in all cases and in selected cases CT angiogram were available. Data collated included patients’ demographic data, etiology of ICH, baseline GCS, post-oprative ventilation needed and GOS score at 6 months after operation. The data was statistically analyzed using SPSS 23.0. The treatment of personal health data of this observational research was in compliance with the Helsinki Declaration. Ethical clearance was taken from the CMC Ethical Review Committee. No consent was needed from the patients involved in this retrospective study. Several measures were taken to ensure confidentiality of the collected information. Reviewers and researchers signed a confidentiality agreement to maintain the secrecy of the information. The reviewers would never contact individual patients.

Surgical Procedures: The goal was evacuation of the haematoma, usually assisted by loop and in some hospitals by microscope. Endoscopic procedures and stereotactic guided hematoma aspiration were not performed in any cases. For all cases of basal ganglia hemorrhages were approached by using the operating microscope. The small craniotomies were generally standard pterional craniotomies intended to facilitate exposure of the sylvian fissure. The opening of the dura was performed in a curved and in some cases stellate fashion, and the exposed brain was covered by augmentive duraplasty mainly with artificial dura mater and in some cases with Galea Aponeurotica.

Results:
During the study period, 95 patients were treated with craniotomy with clot evacuation for spontaneous ICH. Mean age was 50 (±16.23) years, and 61 patients were male and 34 patients were female. The
hemorrhage lateralized to the left in 67 patients and
to the right in 28 patients. Most of the patients were
more than 40 years of age. On admission mean
GCS score was 6.2 (±1.91) (range 4-10), mean
hematoma volume was 61 ml (range 35-90 ml), mean
midline shift was 10 mm (range 6-16 mm).

### Table-I

**Baseline investigations of the patient**

<table>
<thead>
<tr>
<th>Variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, in years</td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>50 (±16.23)</td>
</tr>
<tr>
<td>Range</td>
<td>20-80</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>61 (64%)</td>
</tr>
<tr>
<td>Female</td>
<td>34 (36%)</td>
</tr>
<tr>
<td>Aetiology</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>70 (73.68%)</td>
</tr>
<tr>
<td>Aneurism rupture</td>
<td>5 (5.26%)</td>
</tr>
<tr>
<td>Vascular malformation</td>
<td>2 (2.10%)</td>
</tr>
<tr>
<td>Others</td>
<td>18 (18.96%)</td>
</tr>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>Temperoparital</td>
<td>48 (51.0%)</td>
</tr>
<tr>
<td>Froto-parietal</td>
<td>19 (19.0%)</td>
</tr>
<tr>
<td>Fronal</td>
<td>9 (9.0%)</td>
</tr>
<tr>
<td>Parieto-occipital</td>
<td>7 (7.0%)</td>
</tr>
<tr>
<td>Posterior fossa</td>
<td>12 (13.0%)</td>
</tr>
<tr>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>28 (29%)</td>
</tr>
<tr>
<td>Left</td>
<td>67 (71%)</td>
</tr>
<tr>
<td>Pre-operative GCS</td>
<td></td>
</tr>
<tr>
<td>Mean (±SD)</td>
<td>6.2 (±1.91)</td>
</tr>
<tr>
<td>Range</td>
<td>4-10</td>
</tr>
</tbody>
</table>

Data are presented as frequency and percentage if not otherwise mentioned.

Outcome was assessed by the Glasgo outcome scale (GOS) score, when patients returned for follow-
up after 6 months. Good outcome was defined as
modified GOS of 4-5 and bad outcome as GOS score
of 1-3. Five patients (62%) had good and three
patients (38%) had poor outcome. after 6 months
was appreciated as favorable (GOS score 4-5) in 63
(66.32%) cases and poor (GOS score 1-3) in 32
(33.68%) cases including 20 (21.5%) deaths.

Graphs Showing Age incidence and Locations of
Intracerebral haematoma

### Table-II

**6 months outcome of the patients by GOS score**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>GOS score</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favourable</td>
<td>4-5</td>
<td>63 (66.32%)</td>
</tr>
<tr>
<td>Poor</td>
<td>1-3</td>
<td>32 (33.68%)</td>
</tr>
</tbody>
</table>

Out of this 95 operated cases good recovery were
found in 25, moderate disability in 38, severe disability
in 12 patients, 20 (21%) patients died. A statistical
analysis showed that the GCS score at admission
was significantly higher in the favorable outcome
group than that in the poor outcome group (P = 0.045).
Discussion:
The role of surgery for most patients with spontaneous ICH remains controversial. The theoretical rationale for hematoma evacuation revolves around the concepts of preventing herniation, reducing ICP, and decreasing the pathophysiological impact of the hematoma on surrounding tissue by decreasing mass effect or the cellular toxicity of blood products.

Randomized trials comparing surgery to conservative management have not demonstrated a clear benefit for surgical intervention.\(^\text{16}\)

According to Guidelines for the Management of Spontaneous ICH (Guideline for Healthcare Professionals From the American Heart Association/ American Stroke Association) Supratentorial hematoma evacuation in deteriorating patients might

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Table-III

Association between pre-operative GCS and 6 months GOS

<table>
<thead>
<tr>
<th>Pre-operative GCS</th>
<th>Glasgow outcome scale score after 6 months of surgery</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good recovery (GOS-5)</td>
<td>Moderate disability (GOS-4)</td>
</tr>
<tr>
<td>GCS 4-5</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>GCS 6-8</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>GCS 9-10</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>38</td>
</tr>
</tbody>
</table>

Data are presented as frequency.
be considered as a life-saving measure (Class IIb; Level of Evidence C) and decompressive craniectomy with or without hematoma evacuation might reduce mortality for patients with supratentorial ICH who are in a coma, have large hematomas with significant midline shift, or have elevated ICP refractory to medical management.\textsuperscript{16}

ICH incites ICP elevation by several distinct mechanisms. Initially, the hematoma volume itself, which can expand for up to 24 hours after the ictus\textsuperscript{17}, impacts the intracranial volume buffer capacity. Subsequently, osmotically active proteins in the hematoma cause edema formation in the surrounding tissue, with approximately 75\% of patients experiencing an increase in perihematomal edema within the first 24 hours.\textsuperscript{18} The majority of the reports on decompressive craniectomy following ICH involve a combination of decompression with concurrent clot evacuation. The mortality rates for patients undergoing such intervention in these studies were considerably better than the natural history, as the mortality of the latter approaches 86\%.\textsuperscript{19} In our study, the outcome after 6 months was appreciated as favorable (GOS score 4-5) in 63 (66.32\%) cases and poor (GOS score 1-3) in 32 (33.68\%) cases including 20 (21.5\%) deaths. A similar study conducted in a private hospital of Dhaka revealed that 12 patients (41\%) had good and 17 patients (59\%) had poor outcome and mortality was 41\% following decompressive craniotomy and clot evacuation.\textsuperscript{20}

Complications following this type of surgery are re-bleed with increased size of hematoma, development of hydrocephalus and brain swelling. In addition, different medical complications occurred. However, such medical complications are common in a neurointensive care unit. Sixty five (68\%) patients of our study required ventilator support. With regard to the complications after craniotomy, postoperative hydrocephalus developed in ten patients (where V-P shunt were done) , and meningitis was observed in three patients. A statistical analysis showed that the GCS score at admission was significantly higher in the favorable outcome group than that in the poor outcome group. The limitations of our study are its retrospective design, the small sample size, and the heterogeneity of the patients with respect to the origin of ICH. Nevertheless, our preliminary results are encouraging and justify the initiation of a prospective study. Our results suggest that craniotomy with hematoma evacuation might be a useful surgical procedure for selected patients with large hemispheric hypertensive ICH and is feasible and may also be safe. There were no deaths related directly to surgery. Nonetheless many additional factors are involved in driving outcome following ICH, and therefore large, multicenter, randomized trials are needed to accurately assess the role of craniotomy and hematoma evacuation in optimal ICH management.

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**References:**


