

## Predictors of Surgical Intervention and Predicting Mortality in Patients with Spontaneous Intracerebral Hemorrhage

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### Abstract

**Background:** Intracerebral Hemorrhage (ICH) is a major life threatening condition, for optimizing therapeutic efforts an early outcome assessment is essential.

**Aim of Study:** Recognize the factor affecting the outcome in patients with spontaneous intracerebral hematoma.

**Patients and Methods:** Data of cases had acute ICH between February 2016, and July 2018, were prospectively included. ICH score was applied, and we assessed outcome by the rate of mortality at 30-day and functional outcome at 6-month by Glasgow Outcome Scale (GOS).

**Results:** The study included 22 patients during its period. Rate of mortality at thirty day was (40.9%) 9 patients, and the incidence of patients had good functional outcome at 6 months was (36.4%), 8 patients with a Glasgow Outcome Scale (GOS) 4 to 5 at 6 months.

**Conclusions:** The Initial neurological state, (GCS score) pre-operative, with hematoma volume were a good predictors for detection the mortality rate after 30 days in case of the patients with primary spontaneous ICH. Patients with pre-operative GCS below 9 and hematoma volume more than 42.6 had a great risk of bad short term outcome. The ICH score predict probably the mortality after 30 days and 6 month outcome (the ICH score on admission inversely related to outcome). Younger age and lobar ICH location, were important predictors of surgical intervention.

**Key Words:** Spontaneous intracerebral hematoma – Surgical treatment – Factors affecting outcome – Glasgow coma scale – Glasgow outcome scale.

### Introduction

Spontaneous Intracerebral Hemorrhage (ICH) still presents challenges to neurosurgeons. Intracerebral hemorrhage is about 10-15% of a strokes, the good functional outcome with independency is obtained in only 20% of the cases with spontaneous ICH after 3 months of the onset of the intracerebral hemorrhage [1]. ICHs are subdivided into primary,

and secondary hematomas [2]. The primary type has a higher incidence than secondary type, account about 80% of all ICHs. The cause is destruction of the intracerebral small vessels either due to hypertension or amyloid angiopathy [3]. Secondary ICHs are due to trauma, neoplasms, arteriovenous malformations, aneurysms, or the hemorrhagic alteration of brain infarction. The clinical presentation of ICH depends on the site and volume of the hemorrhage, patient age and existence of other co morbidities [4]. Initial assessment of the outcome of these cases is deeply helpful for management optimization and avoidance of the over management that leads to a predicted bad outcome. There are a lot of scoring systems that can predict outcome in patients suffering from intracerebral haemorrhage. The ICH score (Table 1) was done to evaluate the rate of mortality after 30 days ranged from 0 to 6 [5]. We performed a study to analyze the outcome as rate of mortality after 30 days functional outcome after 6-months by Glasgow Outcome Scale (GOS) (Table 2).

Table (1): The ICH score [5].

Component	Point
<b>GCS score:</b>	
13-15	0
5-12	1
3-4	2
<b>ICH volume, cm<sup>3</sup>:</b>	
<30	0
>=30	1
<b>IVH:</b>	
No	0
Yes	1
<b>Infratentorial origin:</b>	
No	0
Yes	1
<b>Age, y:</b>	
<80	0
>=80	1
Total	0-6

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Table (2): The Glasgow Outcome Scale (GOS) [6].

(GOS) score	Functional status
5	• Good recovery: Resumption of normal life despite minor deficits
4	• Moderate disability: Disabled but independent; can work in sheltered setting
3	• Severe disability: Conscious but disabled; dependent on others for daily support
2	• Persistent vegetative state: Minimal responsiveness
1	• Death

### Patients and Methods

Data of patients with ICH from February 2016 to July 2018, were prospectively collected. ICH score was used, and we assessed Outcome by rate of mortality after 30 days and functional outcome after 6-months by Glasgow Outcome Scale (GOS), 22 cases suffering from spontaneous intracerebral hemorrhage with hematoma were selected the volume equals or more than 30cc in supratentorial and equals or more 4 cm infratentorial the Glasgow Coma Scale (GCS) equals or more than 6. We excluded patients with GCS less than 6, absent of brain stem reflexes, and secondary hemorrhages were excluded.

### Results

A total of 22 patients average (58.5 years) (range from 32 to 80 years). One patient (4.5%) was 80 years of age. 14 males, (63.6%) 8 female (36.4%) average GCS score at the start was 9 (from 6 to 12). The data of the patients are collected in (Table 3). Arterial hypertension was present in (81.8%) (n=18 patients), a smoking was present in 11 patients (50%) a pre-operative therapy that affected hemostasis Warfarin use was taken in only 3 cases (13.6%), while 8 patients (36.4%) received aspirin (325mg per day). The most common location Figs. (1-3) of the bleeding was the basal ganglia and thalamic 17 patients (77.3%) followed by, lobar 4 patients (18.2%), post fossa (4.5%, n=1 patients). The ICH volume was 30-65 with average (42.6) ml relationship between conscious level and average volume of hematoma: GCS 9-12 average volume was 38.6cc, and GCS 6-8 average volume was 48cc. Intraventricular Hemorrhage (IVH) was detected in the first CT of 10 cases (45.5%). The depth of the hematoma from the cortical surface was less than or equal 10mm in 13 patients (59.1 %) and more than 10mm in 9 patients (40.9%).

The short term outcome at 30 days 9 patients (40.9%) were dead. 5 patients (22.7%) had good outcome (GOS 4 to 5), and 8 patients (36.4%) had major disability (GOS 2 to 3). At 6 months 8 patients (36.4%) had good outcome (GOS 4 to 5). 5 patients (22.7%) alive with major impairment (GOS 2 to 3).

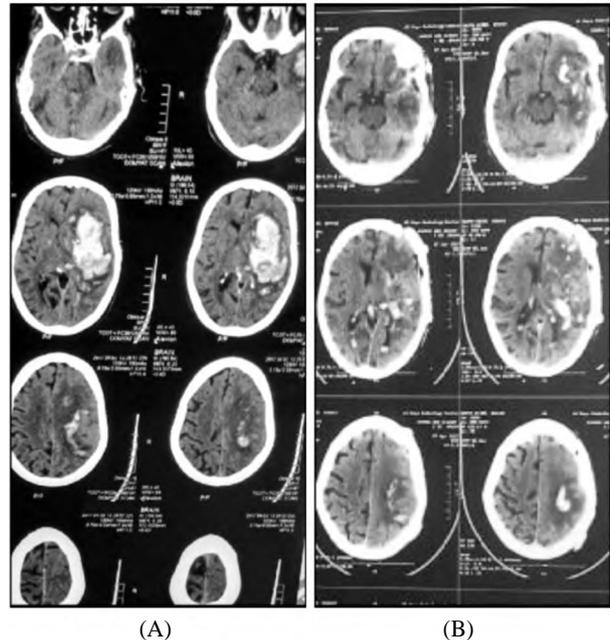


Fig. (1): Left basal ganglia hematoma in 80 years old female patient pre-operative (A) and post-operative (B).

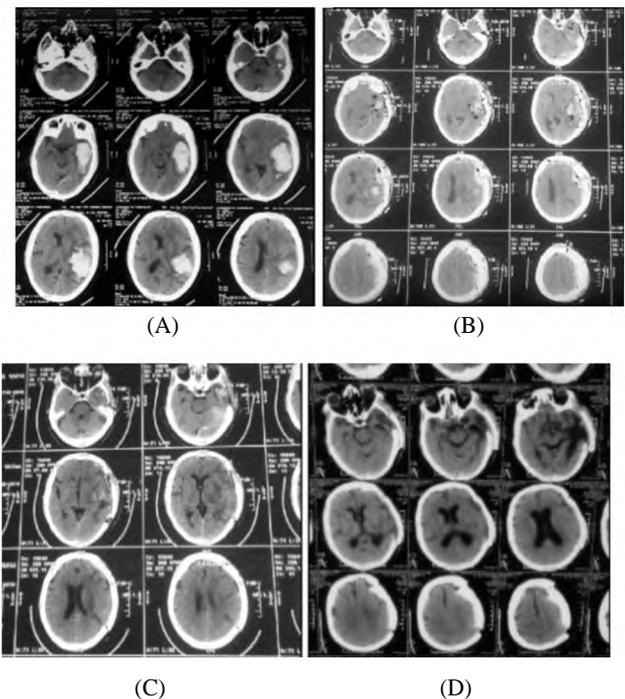


Fig. (2): Left temporal hematoma in 65 years old female patient pre-operative CT (A) Complicated by extradural hematoma and residual (B) Immediate evacuated (C), Follow-up after 6 month (D).

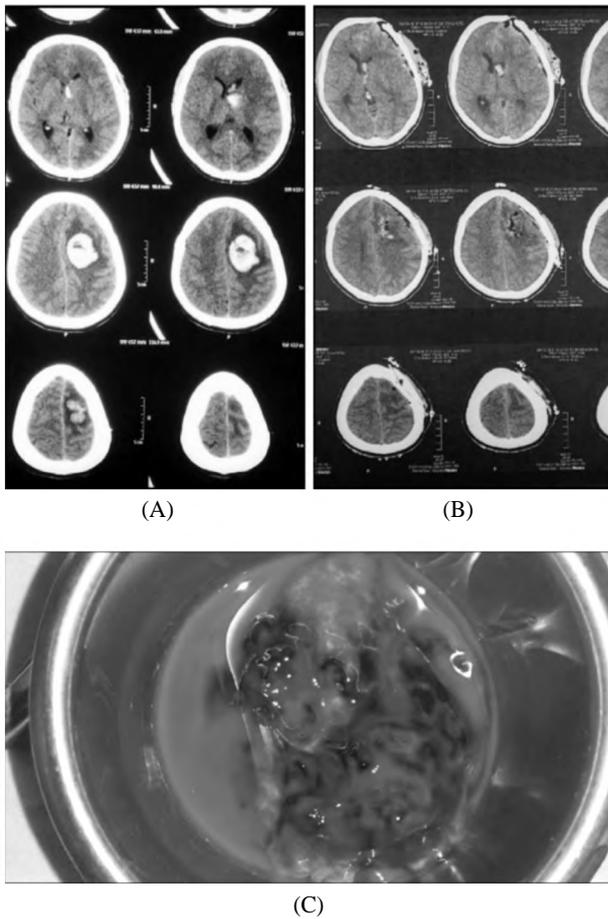


Fig. (3): Left frontal hematoma in female patient 32 years old on warfarin pre-operative CT A) post-operative CT (B) hematoma (C).

Table (3): Characteristics of 22 patients of the study.

Patients (n)	22
Male/ female	14 (63.6%)/ 8 (36.4%)
Age (years)	Average 58.5
<i>Glasgow Coma Scale (GCS) admission:</i>	
GCS=6-8, n (%)	10 (45.5%)
GCS=9-12, n (%)	12 (54.5%)
<i>Comorbidities, n (%):</i>	
Hypertension	18 (81.8%)
Smoking	11 (50%)
Use of anticoagulation	3 (13.6%)
Use of antiplatelet	8 (36.4%)
<i>Location:</i>	
Basal ganglia and thalamic	17 (77.3%)
Lobar	4 (18.2%)
Post fossa	1 (4.5%)
<i>Intraventricular hemorrhage:</i>	
Intracerebral hemorrhage volume (ml)	10 (45.5%)
Depth ≤ 10mm	30-65 (42.6%)
> 10mm	13 9

### Discussion

Intracerebral Hemorrhage (ICH) is a major life threatening condition. The appropriate management is debatable and still a question of many studies with several treatment options [7,8].

It is difficult to detect early prognosis causing persistent doubt about the “best initial treatment. From this point of view, we did our study to evaluate rate of mortality after 30 days and functional outcome after 6-months. As regard ICH score the 30 day mortality increased with increases in the scores' values. ICH score could predict outcome accurately (30-day mortality). Score 2 mortality was 25%, score 3 mortality was 55.6%, score 4 mortality was 100%. In other study the rate of mortality at 30 days for the cases of spontaneous ICH ranging from 25 to 52% [9,10]. In our study the short term outcome at 30 days. Table (4) 9 patients (40.9%) were dead. 5 patients (22.7%) had good outcome (GOS 4 to 5), and 8 patients (36.4%) alive significant impairment (GOS 2 to 3). At 6 months 8 patients (36.4%) had good outcome (GOS 4 to 5). 5 patients (22.7%) alive with major disability (GOS 2 to 3). Corresponding to our data a study, done by Van Asch et al., with a functional outcome with the rate of independency ranging from 12 to 39% [11].

Our study showed increase 30 days mortality with increase of age of the patients, in patients less than 58.5 years mortality rate was 22.2%, and in patients more than 58.5 years mortality rate was 77.8%. Older people had more worse outcome [12].

Presence of co morbidities all patients died were hypertensive, 44.4% of patients used antiplatelet or anticoagulation died. The GCS score is a good predictor and reliable neurological assessment tool [13]. There is a strong relationship between GCS on admission (pre-operative) and 30 days mortality GCS below or equal 9, the 30 days mortality rate was 88.9% (8/9). GCS more than 9 days mortality rate was 11.1% 1/9. Relationship between hematoma volume and outcome 30 days mortality: Less than 42.6CC 30 days mortality was 2/11 (18.2%), more than 42.6CC 30 days mortality was 7/11 (63.6%) so this study proved the neurological status at beginning (GCS) and the volume of ICH were strong predictors of outcome as proved in others [5,9,11,13,14]. Lobar ICH had a better outcome [15].

In our study (infratentorial) one patient and died, basal ganglia and thalamic 7 patients from 17 patients died (41.2%), lobar 1 patient from 4 patients died (25%). The ICH Score is a good for

prediction long-term functional outcome after spontaneous Intracerebral Hemorrhage (ICH) [5]. As regard our study six-month functional outcome 8 patients (36.4%) had good outcome (GOS 4 to 5). 5 patients (22.7%) were alive with major disability (GOS 2 to 3). With increasing points on the ICH scores there is a decreasing in functional outcome was found (Table 5).

Table (4): Predictors of death within 30 days.

	30 days mortality
<i>Age (per year):</i>	
<58.5 years	2/9 22.2%
>58.5 years	7/9 77.8%
Sex	M 6 F 3
<i>GCS on admission:</i>	
≤9	8/9 88.9%
>9	1/9 11.1%
<i>Comorbidities:</i>	
Hypertension	9/9 100%
Use of AP AC	4/9 44.4%
<i>Imaging features:</i>	
Location (infratentorial)	1/1 100%
Supratentorial	
Basal ganglia and thalamic	7/17 41.2%
Lobar	1/4 25%
<i>ICH volume:</i>	
<42.6	2/11 18.2%
>42.6	7/11 63.6%

Table (5): Relation between ICH score and 6 month functional outcome.

ICH score	Patients	Died 30 day	Good outcome (GOS 4 to 5) 6m	Significant impairment (GOS 2 to 3) 6m
2	12	3 (25%)	5 (41.7%)	4 (33.3%)
3	9	5 (55.6%)	3 (33.3%)	1 (11.1%)
4	1	1 (100%)		

**Conclusion:**

The initial neurological state, (GCS score) pre-operative, with hematoma volume were a good predictors for detection the mortality rate after 30 days in case of the patients with primary spontaneous ICH. Patients with pre-operative GCS below 9 and hematoma volume more than 42.6 had a great risk of bad short term outcome. The ICH score predict probably the mortality after 30 days and 6 month outcome (the ICH score on admission inversely related to outcome). Younger age, and lobar ICH location, were important predictors of surgical intervention.

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## تحديد التدخل الجراحي والتنبؤ بالنتائج في حالات نزيف المخ الأولي

مقدمة: يمثل نزيف المخ تهديداً كبيراً على حياة المرضى. لتحديد العلاج المناسب يكون التقييم الأولي والتنبؤ بالنتائج مهم.

الطرق: تمت الدراسة في الفترة ما بين فبراير ٢٠١٦ ويوليو ٢٠١٨. تم تجميع بيانات المرضى وإستخدام معدل نزيف المخ (ICH Score) وتقييم النتائج عن طريق حساب معدل الوفاة بعد ٣٠ يوم وتقييم المعدل الوظيفي للمرضى.

النتائج: تضمنت الدراسة ٢٢ مريض خلال تلك الفترة كان معدل الوفاة بعد ٣٠ يوم حوالي ٤٠.٩٪ ونسبة المرضى بمعدل وظيفي جيد بعد ٦ شهور ٣٦.٤٪.

الخلاصة: الفحص الأولي للمريض وحجم نزيف المخ يمثلان عاملان مهمان لتحديد والتنبؤ بمعدل الوفاة بعد ٣٠ يوم في حالات نزيف المخ الأولي. تكون درجة الخطورة مرتفعة لحدوث الوفاة في حالة درجة الوعي أقل من ٩ وحجم نزيف المخ أكثر من ٤٢.٦. معدل نزيف المخ (ICH Score) يمكنه التنبؤ بالنتائج (هناك علاقة عكسية ما بين معدل نزيف المخ (ICH Score) والنتائج) في حالة زيادة المعدل تكون النتائج أسوأ. أيضاً صغر عمر المريض والنزيف القصي للمخ مهمين للتنبؤ بنتائج الجراحة.