Traumatic Intracerebral Hemorrhage : Clinical and Radiological Outcomes at Qena University Hospitals

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Abstract

Background: Traumatic brain injury (TBI) is considered the most common cause of death and disability among young individuals, Traumatic intracerebral hemorrhage (TICH) is a common complication of traumatic brain injury. It represents the leading cause of morbidity and mortality in individuals also it is known to be the most important determinant of outcome in polytraumatic patient.

Objectives: Evaluation of the clinical and radiological outcomes in patients with traumatic intracerebral hemorrhage admitted to Neurosurgery department at Qena university hospitals.

Patients and methods: This study was conducted by collecting data from the records of 37 patients with traumatic intracerebral hemorrhage admitted to Neurosurgery Department, Qena University Hospital, South Valley University, from February 2021 to November 2021. Patients selected for the study will be evaluated based on history, general examination, neurological examination using Glasgow coma scale and radiological findings, evaluation using Extended Glasgow outcome scale (GOSe) and disability rating scale (DRS).

Results: There was statistically significant relation between mortality and Glasgow coma scale ($p<0.05$). There was no statistically significant relation between mortality and age, gender, mechanism of injury, intensive care unit admission as well as surgical interventions ($p>0.05$). On the other hand, patients who did not survive showed lower GCS as well as GOSe when compared to patients who survived.

Conclusion: Traumatic intracerebral hematoma is a serious condition that prompts rapid management. Glasgow coma scale is a predictor to determine outcome in cases of traumatic intracerebral hematoma.

Keywords: Traumatic; Intracerebral hematoma ; Glasgow coma scale.

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Introduction

Traumatic head injury has been noted in human civilization for 3000 years. Descriptions of head injury are available in ancient Sumerian, Egyptian, and Greek medicine. Hippocrates suggested that head injury in which the cranium was perforated might be followed by serious consequences, such as the extravasation of blood. **(ROSE, 2006)**. Traumatic brain injury (TBI) is considered the most common cause of death and disability among individuals. It represents a wide spectrum of pathophysiological entities comprising diffuse axonal injury with damage to white matter tracts, traumatic intracerebral hematoma (TICH), and extra cerebral bleeding, with or without mass effect.

Brain damage after head trauma can be classified into a primary and secondary damage. The primary brain insult is inflicted at the moment of impact and initiates a complex series of events leading to secondary brain insult. This secondary insult can occur due to either intracranial causes such as an expansion of hemorrhagic lesions and brain swelling or systemic causes such as hypotension, hypoxia, pyrexia, hyperglycemia and the resultant activation of several biochemical cascades. **(Hardman and Manoukian, 2002).** Traumatic intracerebral hemorrhage (TICH) is a common complication of traumatic brain injury. It occurs in approximately 13 to 35% of patients following a traumatic brain injury. It can occur following either closed or penetrating head injury. It may be associated with other lesions including skull fractures and extra parenchymal bleeding. **(Heegaard and Biros, 2007)**

Traumatic intracerebral hemorrhage, like spontaneous hemorrhage, often expands over time. Several studies have analyzed the factors related to their expansion. The importance of the study of TICH is based on the fact that the growth of contusions directly influences the therapeutic management and outcome of patients who have suffered a TBI where it can cause lifelong cognitive, physical, and psychological disability **(Narayan et al., 2008).** Most traumatic intracerebral hemorrhages do not require surgical intervention but strict follow up is mandatory to avoid delayed expansion of the hematoma and delayed deterioration. **(Mendelow et al., 2015).** Despite being a well-known feature of traumatic brain injury, studies on traumatic intracerebral hemorrhage are limited. **(Carnevale et al., 2018).**

The goal of our research is to evaluate patients with traumatic intracerebral hemorrhage based on clinical and radiological outcome.

Patients and methods

From February 2021 to November 2021., Thirty seven patients were admitted with traumatic intracerebral hematoma to Neurosurgery Department, Qena University Hospital; South Valley University.

Patients were divided to 3 groups according to radiological findings: patients who had pure intracerebral hematoma (ICH) on admission CT and were treated conservatively were allocated to group A, while patients who had pure ICH which needed surgical evacuation were allocated to group B1 and lastly patients who had surgical ICH associated with subdural/intraventricular hemorrhage were allocated to group B2.

Inclusion criteria included

All patients with head trauma who showed sizable intracerebral hematoma -with or without subdural hematoma or intaventricular Hge - were selected for the study.

Exclusion criteria included

Traumatic intracerebral hemorrhage associated with extradural hemorrhage or depressed fracture on their admission CT brain also cardiac patients and those on anticoagulants were excluded from the study.

Every patient selected for the study was subjected to the following

History taking including mode and timing of trauma and any underlying medical disease from patient or relatives. Neurological examination using Glasgow coma scale (GCS) **(Teasdale G et al.,1974)** .Radiological evaluation using CT brain.

Indicators for surgical or conservative managment

Surgical evacuation of traumatic intracerebral hge included hematomaes greater than 20 cm3 in volume with midline shift of at least 5 mm and/or cisternal compression on CT scan, and patients with any lesion greater than 50 cm3 in volume or hematomas with signs of progressive neurological deterioration referable to the lesion, medically refractory intracranial hypertension , signs of mass effect on computed tomographic (CT) scan and Glasgow Coma Scale (GCS) scores ≤ 8.Patients who do not show evidence for neurological compromise, have controlled intracranial pressure (ICP), and no significant signs of mass effect on CT scan may be managed nonoperatively with intensive monitoring and serial imaging.

Outcome evaluation

Clinical outcome involved evaluation using Extended Glasgow outcome scale (GOSe) at time of discharge (**Teasdale et al., 1998**) and disability rating scale (DRS) after 3 months (**Rappaport et al., 1982**)
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Radiological outcome involved CT brain done after 3 months from the traumatic event.

The current study has been approved by the Ethics committe of faculty of Medicine, SVU,Qena,Egypt. With Ethical approval code: SVU-MED- NES014 -1- 21- 2 -137.

Statistical analysis

Data was analyzed using IBM Statistical Package for Social Sciences software (SPSS), (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). The Kolmogorov-Smirnov test was used to verify the normality of distribution. Continuous data was expressed as mean ± standard deviation, median & IQR while categorical data as numbers and percentage. A statistical value <0.05 was considered as significant.

Results

Our study was conducted on 37 cases who were divided in 3 groups. 8 patients who had intracerebral hematoma and managed conservatively were allocated to group A. Group B1 consisted of 17 patients who had pure intracerebral hematoma and were managed surgically. Group B2 consisted of 12 patients who had intracerebral hematoma associated with other CT findings such as intraventricular and/or subdural hemorrhage and were managed surgically.

The study included 37 patients, 33 males to 4 females with male to female ratio 8.25:1. The mean age was 29.73± 13.88 years (range: 7-63 years). The most common age group was age group between 19 – 40 years representing 59.5% of studied cases. the majority of cases (70.3%) were living in rural areas while 11 cases (29.7%) were living in urban areas (**Table.1**).

Table 1. Distribution of patients regarding demographic data

Demographic data	Studied patients (n = 37)	
	No.	%
Age (years):		
Range	7.0 – 63.0	
Mean± SD	29.73± 13.88	
Median	23.0	
Age groups:		
≤ 18 years	7	18.9%
19- 40 years	22	59.5%
41- 60 years	7	18.9%
≥ 60 years	1	2.7%
Gender:		
Male	33	89.2%
Female	4	10.8%
Residence:		
Rural	25	67.6%
Urban	12	32.4%

The most common cause of traumatic intracerebral hemorrhage was road traffic accidents representing 59.5% of cases. Assault from others was responsible for 21.6% and fall from height was responsible for 18.91% of cases (**Table.2**).

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Table2. Distribution of patients regarding mechanism of injury

Variables	Studied patients (n = 37)	
	No.	%
Mechanism of injury:		
RTA	22	59.5%
Assault	8	21.6%
Falling from height	8	18.9%

Of all 37 patients, 20 patients had GCS score 4-8, 4 patients had GCS score 13-14 and 13 patients had GCS score 9-12 at the time of admission. The mean GCS score was 8.59± 2.97. Extended Glasgow outcome score ranged from 1 to 8 with mean score was 3.65± 2.47. 48.6%) of Patients had good outcome (GOSE score > 4) that means moderate disability or good recovery while 51.4% cases had poor outcome (GOSE score ≤ 4) that indicate severe disability, vegetative state, or death (**Table.3, Table.4**).

Table 3. Distribution of patients regarding GOSE

Data	Studied patients (n = 37)	
	No.	%
Extended Glasgow outcome scale (GOSe)		
Range	1 – 8	
Mean± SD	3.65± 2.47	
Median	3.0	
Good(GOSE score >4)	18	48.6%
Poor(GOSE score ≤ 4)	19	51.4%

Table 4. The outcome of the included patients

Data	Group A	Group B1	Group B2
No.of patients			
Good (>4)	7	9	2
Poor (≤ 4)	1	8	10
Died	0	5	5

The mean DRS was 11.04± 9.92 with range from 0 to 30. The mean was 11.04± 9.92. 27% of studied cases were recorded as deaths. 16.2% had moderately severe disability, while 10.8% had partial disability.

Association between mortality and different parameters:

As shown in (**Table 5 and 6**), There was no statistically significant relation between mortality and site of hemorrhage detected by CT brain (p>0.05). Also, there was no statistically significant relation between mortality and age, gender, mechanism of injury, ICU admission as well as surgical intervention (p>0.05). On the other hand, died patients showed low GCS as well as GOSe when compared to patients who survived (p<0.001)

Table 5. Association between mortality and different categorical parameters

Variables		Survived (N= 27)		Died (N= 10)		P-value	Sig.
		N	%	N	%		
Age groups	**≤ 18 years**	6	22.2%	1	10.0%	0.250	NS
	19- 40 years	15	55.6%	7	70.0%		
	41- 60 years	6	22.2%	1	10.0%		
	≥ 60 years	0	0.0%	1	10.0%		
Gender	**Male**	24	88.9%	9	90.0%	0.923	NS
	Female	3	11.1%	1	10.0%		

Variables		Survived (N= 27)		Died (N= 10)		P-value	Sig.
		N	%	N	%		
Mechanism of injury	Assault	8	29.6%	0	0.0%	0.128	NS
	Falling from height	4	14.8%	3	30.0%		
	RTA	15	55.6%	7	70.0%		
CT brain						0.051	NS
	Frontal ICH	15	55.6%	2	20.0%		
	Occipital ICH	0	0.0%	2	20.0%		
	Temporal ICH	10	37.0%	5	50.0%		
	Temporoparietal ICH	2	7.4%	1	10.0%		
ICU admission	No	1	3.7%	0	0.0%	0.730FET	NS
	Yes	26	96.3%	10	100.0%		
Surgical intervention	No	8	29.6%	0	0.0%	0.153	NS
	Yes	19	70.4%	10	100.0%		

p≤0.05 is considered statistically significant, p≤0.01 is considered high statistically significant,
SD= standard deviation, -comparison between groups done by Pearson Chi-Square test, FET: Fischer Exact test.

Table 6. Association between mortality and different numerical parameters.

Variables	Survived (N= 27)		Died (N= 10)		P-value	Sig.
	Mean	±SD	Mean	±SD		
Age	28.96	13.03	31.80	16.54	0.588	NS
GCS	9.89	2.33	5.10	.99	**<0.001**	HS
GOSe	4.63	2.19	1.00	.00	**<0.001**	HS
DRS	11.04	9.92	.	.	-	-

p≤0.05 is considered statistically significant, p≤0.01 is considered high statistically significant,
SD= standard deviation, -comparison between groups done by Student T test, Mann-Whitney U test, Pearson Chi-Square test.

Case Presentation:

Male patient, 5yrs old, with history of road traffic accident. He presented to our department with disturbed conscious level.

On evaluation, patient was:

- Vital signs:
BP : 170/90mmHg. Pulse: 72 b/m RR: 10 c/m
- GCS : 8/15 E2V1M5
- RTS : 10

CT brain showed showing Rt parietotemporal intracerebral hematoma with intraventricuar extension.

He was treated surgically by evacuation of the hematoma.

Patient was then followed up in the ICU and supportive measures were administered.

Follow up CT brain was done and showed.

He was discharged two weeks later and followed up after 3 months in the outpatient clinic.

At time of discharge, patient was fully conscious with GOSE = 6.
No complications were encountered during the follow up period. At the final visit, he was given the disability rating scale questionnaire and his DRS was 5 showing moderate disability.

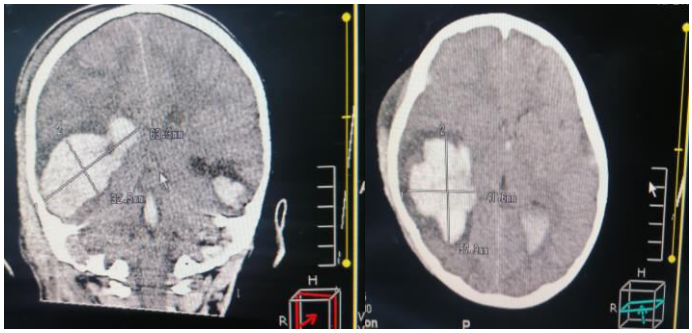

Fig 1. Initial CT images: pre-operative CT, brain window, axial view and coronal view showing Rt parietotemporal intracerebral hematoma and associated intraventricular hemorrhage.

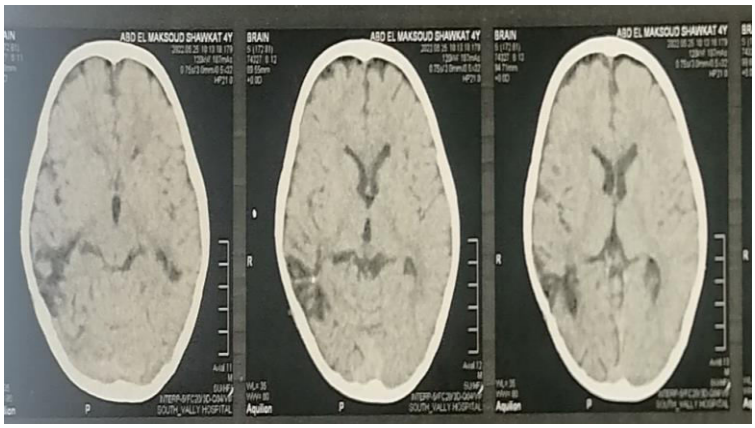

Fig2. Postoperative CT scan images: Follow up CT brain after 3 months, showing encephalomalacia at site of hematoma.

Discussion

Traumatic brain injury (TBI) is a major worldwide health issue and poses a great socioeconomic burden due to disabilities and treatment costs. **(Langlois et al., 2006)**

Traumatic intracerebral haemorrhage still represents the leading cause of morbidity and mortality in individuals also it is known to be the most important determinant of outcome in polytraumatic patient. **(Bhatia et al., 2019)**

Traumatic intracerebral hemorrhage occurs in approximately 13-35% of traumatic brain injury patients with either closed or penetrating head injury. It may be associated with other lesions including skull fractures and extra parenchymal bleeding. **(Carnevale et al., 2018)**

A male predominance was found, as it included 33 males (89.2%) and 4 females (10.8%) with male to female ratio of 8.25:1. The mean age of 29.73± 13.88 years. The most common age group was age group between 19 – 40 years representing 59.5% of studied cases.

In the same context, the study of **(Narayan et al., 2008),** the mean age of their participants was 43.8 ± 19.6 years and the male-female ratio was 3:1. This shows that traumatic intracerebral hematoma is more common in young adult males.

Our study showed that the majority of these hematomas were due to road traffic accidents (59.5%) followed by assault from others (21.6%). Our results were supported by study of (**Cepeda et al. 2015)** who identified road traffic accidents as the most common mode of trauma comprising 64% of the studied cases.

The current study showed that the mean admission Glasgow Coma Scale score was 8.59± 2.97 and median GCS of 8 with most patients being of moderate TBI group. Group A showed better admission GCS with 4 patients having mild TBI, 4 patients having moderate TBI and no patients had severe TBI. On the other hand, group B2 showed the worst admission GCS with 11 patients having severe TBI and only one patient having moderate TBI according to GCS

classification. The study of (**Narayan et al., 2008**) described similar result as they found a median GCS of 8. However, the study of Chang et al., 2006 found that patients with mild TBI comprised 46% of patients.

Regarding outcome, Patients were evaluated after 3 months and we found that the mean Extended Glasgow outcome scale (GOSe) score was 3.65± 2.47. 18 patients (48.6%) had good outcome (GOSe score > 4), while 19 cases (51.4%) had poor outcome (GOSe score ≤ 4) that indicates severe disability, vegetative state or death. Group A showed the best outcome with 7 patients (87.5%) having GOSe score >4. Group B_1 followed with 9 patients (52.9%) showed GOSe score >4. Group B_2 showed the worst outcome with 10 patients (83.3%) having poor GOSe score <4. According to disability rating scale (DRS), the mean score was 11.04± 9.92. Group A showed less disability/mortality than group B_1 which in turn showed less disability/mortality than group B_2. Similar findings were published by (**Iaccarino et al., 2014**) as they found that 81.6% of patients having good outcome after 6 month follow up period.

Conclusion

Traumatic intracerebral hematoma is a serious condition that prompts rapid management. Glasgow coma scale is a predictor to determine outcome in cases of traumatic intracerebral hematoma.

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