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Surgical Management of Lobar Intracerebral Hemorrhage

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ABSTRACT

Aim of work: We conducted a case study to evaluate the surgical management of lobar intracerebral hemorrhage. **Patients and Methods:** This study included 20 patients who were diagnosed with Lobar ICH between January 2017 and December 2017, All cases were managed surgically. ICH is a neurological emergency and medical care should starts rapidly with stabilization of airway, breathing functions, circulation and other associated pathologies as fits and elevated blood pressure. CT scan was the standard diagnostic tool in the 1ry management of the cases. A routine preoperative investigation as CBC, PT was done. Cases admitted to a postoperative ICU for at least 48 hours and a follow up CT scan was done. Results: We observed all survivors for at least 2 months and asses our outcome using Glasgow Outcome Scale. **Conclusion:** Care of such cases and rehabilitation plays an important role to have a good prognosis.

Keywords: Lobar intracerebral haemorrhage, Traumatic, Spontaneous, Results, Discussion

INTRODUCTION

Intracerebral hemorrhage (ICH) is a devastating disease with high rates of mortality and morbidity. Approximately 10% to 23% of strokes are caused by rupture of cerebral blood vessels and the overall Intracerebral hemorrhage incidence worldwide is 24.6 per 10000 person-years [(1)].

Lobar Intracerebral hemorrhage is the bleeding in the largest part of the brain called the cerebrum. It may be traumatic or spontaneous [(2)].

It is evidenced that vascular malformation, aneurysms and drug abuse are causative factors for spontaneous ICH among young adults while hypertension (most important and prevalent risk factor) [(2)], tumors, vasculopathy, coagulopathy and cerebral amyloid angiopathy are causes among older adults. Other risk factors include low cholesterol levels, heavy alcohol intake and cigarette smoking. Among children, leukemia is found to be a significant cause [(3)].

The acute presentation of ICH can be difficult to distinguish from ischemic stroke. Symptoms may include headache, nausea, seizures and focal or generalized neurological symptoms. Finding such as coma, headache, vomiting, seizures, neck stiffness and raised diastolic blood pressure increase the likelihood of ICH compared to ischemic stroke, but only neuroimaging can provide a definitive diagnosis [(3)].

In addition to a prompt clinical history and neurological examination, rapid neuroimaging with a non-contrast CT is highly sensitive and specific for ICH and is the key of early diagnosis [(4)].CT scan will reveal not only the location and size of the ICH but also intraventricular extension, mass effect, hydrocephalus and early signs of herniation [(5)]. MRI can be as sensitive as CT in determining the presence of hemorrhage, CT angiogram is a very sensitive for identifying associated vascular abnormalities [(5)].

Repeat imaging study should be considered for evaluation of any acute deterioration in the neurological examination or for follow-up of any underlying lesion or vascular anomaly [(6)].

The beneficial effects of surgical management of supratentorial ICH remain controversial [(1)].

The surgical trial in Lobar Intracerebral Hemorrhage (STICH) aims to establish whether a policy of earlier surgical evacuation of the hematoma in selected patients with spontaneous lobar intracerebral hemorrhage will improve outcome compared to a policy of initial conservative treatment[(7)].

The aim of early surgical Traumatic Intracerebral Hemorrhage (TICH) treatment is to prevent secondary brain injury, which is thought to be caused by number of mechanisms. Extravasated blood is believed to be neurotoxic leading to secondary injury that may be avoided by early surgical removal. Larger TICHs may be associated with an ischemic penumbra of brain tissue that could be salvaged and some TICHs expand to the point where they cause mass effect, resulting in secondary brain injury [(8)].

AIM OF THE WORK

To evaluate the surgical management of Lobar Intracerebral Hemorrhage.

PATIENTS AND METHODS

This study is a descriptive analytical clinical trial study for evaluating the clinical and functional outcomes of the surgical cases with lobar intracerebral hemorrhage.

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Exclusion criteria: Patients associated with brain tumors. Patients who have conversion of an ischemic infarction. Recent intracranial surgical intervention.

Preoperative assessment:

1) Personal history: Age : more than 80 or less than 80 years old. Sex. Special habits: (smokers, alcoholics or drug abusers).

2) Past and medical history:

Medical past history: HTN. DM. Cardiac. Hepatic. Old infarction. ESRD.

Drug history: Anticoagulant. Antiplatelet. Oral anti diabetic or insulin. Anti-hypertensive medications. Amphetamine.

3) Clinical presentation: Full general and neurological examination on admission:

1. *General examination:* vital signs and examination of chest, abdomen and limbs was performed by the trauma team to the all traumatic patients. The spontaneous patients were examined and blood pressure was monitored.

2. *Neurological examination:* a) Glasgow Coma Scale. b) Motor power: Assessment of motor affection: Monoplegia. Hemiplegia. Hemiparesis. c) Pupils: Assessment of pupil equality.

4) Investigations:

I. Radiological studies: Computerized Tomography (CT) of the brain showing the hematoma location, size, shape, perihematomal edema and midline shift. It is our first line of radiological studies as it is fast and cheap. Computed Tomography Angiography (CTA) if possible as it can show us the suspected underlying pathologies such as aneurysms and arteriovenous malformation (AVM).

II. Laboratory studies: As a routine investigation in preoperative preparations and as a part of assessment of the patient condition we do: CBC shows the platelet count. PT. INR. LFT (SGOT, SGPT and Bilirubin). KFT (Urea and Creatinine).

5) Treatment:

The beneficial effects of surgical management of supratentorial ICH remain controversial.

The surgical trial in Lobar Intracerebral Hemorrhage (STICH) [(7)] aims to establish whether a policy of earlier surgical evacuation of the hematoma in selected patients with spontaneous lobar intracerebral hemorrhage will improve outcome compared to a policy of initial conservative treatment. Supratentorial hematoma evacuation in deteriorating patients might be considered as a life saving measure. *The potential of decompressive craniectomy (DC) to improve outcomes for patients with ICH has not been well studied. On the basis of the results of the first STICH trial, several authors have suggested that outcomes could potentially be improved with DC for selected patients with high ICP and mass effect related to ICH. DC with or without hematoma evacuation might reduce mortality for patients with supratentorial ICH who are in coma, have large hematomas with significant midline shift, or have elevated ICP refractory to medical management.

The aim of early surgical Traumatic Intracerebral Hemorrhage (TICH) treatment is to prevent secondary brain injury, which is thought to be caused by number of mechanisms [(8)].

Extravasated blood is believed to be neurotoxic leading to secondary injury that may be avoided by early surgical removal. Larger TICHs may be associated with an ischemic penumbra of brain tissue that could be salvaged and some TICHs expand to the point where they cause mass effect, resulting in secondary brain injury.

Statistical Analysis

The data were coded, entered and processed on computer using *SPSS* (version 18).The results were represented in tabular form then interpreted. Mean, standard deviation, range, frequency, and percentage were use as descriptive statistics.

The following test was done: **Chi-Square testX^2** was used to test the association variables for categorical data. **ANOVA (F test)**for normally quantitative variables, to compare between more than two groups, and Post Hoc test (LSD) for pairwise comparisons.

Ethical Considerations

Written informed consent will be obtained. **The study was approved by the Ethics Board of Al-Azhar University.**

RESULTS

Table (1): Distribution of co-morbidity among the studied sample.

	Sample	
	No.	**%**
Traumatic	4	20.0
Spontaneous	16	80.0
Total	20	100.0

This table shows distribution of co-morbidity among the studied sample, traumatic were 4 (20%) and spontaneous were 16 (80%).

Table (2): Distribution of outcome among the studied spontaneous cases

	Sample	
	NO.	**%**
Good recovery	3	18.75
Moderate disability	5	31.25
Severe disability	5	31.55
Death	3	18.75
Total	16	100.0

This table shows distribution of spontaneous among the studied spontaneous cases, good recovery was 3 (18.75%), moderate disability was 5 (31.25%), severe disability was 5 (31.25%) and death was 3 (18.75%).

Table (3): Relationship between outcome and six among the studied Spontaneous cases.

			Good recovery	**Moderate disability**	**Severe disability**	**Death**
Sex	Male	No.	2	4	4	3
		%	12.5%	25%	25%	18.75%
	Female	No.	1	1	1	0
		%	6.25%	6.25%	6.25%	0%

The incidence of ICH is more than in males so it is appeared to be significant in relation to the outcome.

Table (4): Relationship between outcome and INITIAL GCS among the studied Spontaneous cases.

			Good recovery	**Moderate disability**	**Severe disability**	**Death**
INITIAL GCS	<8	No.	0	1	3	0
		%	0%	6.25%	18.75%	0%
	9-10	No.	1	0	1	3
		%	6.25%	0%	6.25%	18.75%
	11-15	No.	2	4	1	0
		%	12.5%	25%	6.25%	0%

The surgical outcome of is favourable with higher initial GCS.

Table (5): Relationship between outcome and site among the studied Spontaneous cases.

			Good recovery	**Moderate disability**	**Severe disability**	**Death**
SITE	Frontal	No.	0	0	1	1
		%	0%	0%	6.25%	6.25%
	Parietal	No.	1	3	3	2
		%	6.25%	18.75%	18.75%	12.5%
	Occipital	No.	2	2	1	0
		%	12.5%	12.5%	6.25%	0%

The surgical outcome of occipital hematomas is better than the parietal and frontal hematomas.

Table (6): Relationship between outcome and SIZE cc among the studied Spontaneous cases.

			Good recovery	Moderate disability	Severe disability	Death
SIZE cc	<50 cc	No.	2	5	0	0
		%	12.5%	31.25%	0%	0%
	>50 cc	No.	1	0	5	3
		%	6.25%	0%	31.25%	18.75%

Regarding the size of the hematoma, the surgical outcome is better in hematomas less than 50 cc.

Table (7): Relationship between outcome and platelet count among the studied Spontaneous cases.

			Good recovery	Moderate disability	Severe disability	Death
platelets count	<150000	No.	0	1	0	3
		%	0%	6.25%	0%	18.75%
	>150000	No.	3	4	5	0
		%	18.75%	25%	31.25%	0%

Patients with a low platelet count had a higher mortality rate

Table (8): Relationship between outcome and CO-MORBIDITY among the studied Spontaneous cases.

			Good recovery	Moderate disability	Severe disability	Death
Co-Morbidity	HTN	No.	3	3	4	0
		%	18.75%	18.75%	25%	0%
	HTN and DM	No.	0	1	1	0
		%	0%	6.25%	6.25%	0%
	HTN and cardiac	No.	0	0	0	1
		%	0%	0%	0%	6.25%
	cardiac and HTN and on AP	No.	0	0	0	2
		%	0%	0%	0%	12.5
	cardiac and on OAC	No.	0	1	0	0
		%	.0%	6.25	0%	0%

Hypertension represents that it is an important risk factor in most cases of ICH, Also cardiac and diabetic patients and patients on AP therapy are risk factors.

Table (9): Distribution of outcome among the studied Traumatic cases

	Sample	
	No.	**%**
Good recovery	2	50.0
Moderate disability	2	50.0
Total	4	100.0

This table shows Distribution of outcome among the studied Traumatic cases, good recovery was 2 (50%) and moderate disability were 2 (50%).

Table (10): Relationship between outcome and initial GCS among the studied Traumatic cases.

		Good recovery		Moderate disability
INITIAL GCS	<8	No.	0	1
		%	.0%	25%
	9-10	No.	1	0
		%	25%	0%
	11-15	No.	1	1
		%	25%	25%

Patients with higher initial GCS gives better outcome, however it is statistically not significant.

Table (11): Relationship between outcome and site among the studied Traumatic cases

		Good recovery		Moderate disability
SITE	Frontal	No.	2	0
		%	50%	0%
	Parietal	No.	0	1
		%	0%	25%
	Temporal	No.	0	1
		%	0%	25%

There were no statistically significant differences between outcome groups regarding site.

Table (12): Relationship between outcome and SIZE cc among the studied Traumatic cases.

		Good recovery		Moderate disability
SIZE cc	<50 cc	No.	2	2
		%	50%	50%

All traumatic patients we had includes in our study had a hematoma size less than 50cc, so the outcome was favourable.

DISCUSSION

Several studies were conducted during the last 10 years to talk about traumatic and spontaneous intracerebral hematomas. Almost all studies reached the conclusion that traumatic hematomas carry a far better prognosis than spontaneous hematomas and that surgery is more justified for traumatic hematomas [(9)].

In our study of 20 patients with lobar ICH managed by surgical intervention our mortality rate for SICH was 18.75% and 0% for TICH which mostly due to small sample size of traumatic patients, and good initial GCS of them. ***Kanaya et al.*** [(10)] reported an overall mortality rate of 44% for SICH and 20% for TICH. He also noted that the most significant predictors of outcome were age, GCS at presentation and hematoma volume.

We noticed that the median age for unfavourable outcome in SICH was 62.5 years and also concluded that the younger the age the better the prognosis. ***Zuccarello et al.***[(11)] conducted a study to determine the role of age in predicting outcome for SICH. He concluded that the younger the age the better the prognosis and that patient above 70 yrs. Old have 97% mortality rate whether the hematoma is spontaneous or traumatic.

A large trial was achieved years ago to detect the average results of outcome for both TICH and SICH [(1)]. They collected all data from the literature and statistically summed them up to obtain the mean results. Of the SICH group, 24% achieved a favorable outcome (our study was 50%). For the TICH group, favorable outcome at was much higher at 66% (our study was 100%). The category of favorable outcome included good recovery and moderate disability and the category of unfavorable outcome included death, vegetative state, and severe disability as outlined by the GOS. For the TICH group, the median GCS score at presentation was 14 for patients who had a favorable outcome (10 in our study) and 7 for those who had an unfavorable outcome. A higher GCS score at presentation was a strong predictor of favorable outcome. In the SICH group, the median GCS score at presentation for those patients who

achieved a favorable outcome was 15 (11 in our study) compared with 12 for patients who had an unfavorable outcome (8 in our study). A higher GCS score was again strongly related to a favorable outcome. Patients with favorable outcomes were also significantly younger in both groups: median age of 60 years compared with 67 years for unfavorable outcomes in patients with SICH (in our study was 57 years compared with 66 years respectively). There was a significant relationship between younger patient age and favorable outcome in both TICH and SICH groups. Sixty-six percent of all TICH patients had favorable outcomes, as determined using the GOS. This compares with a 24% rate of favorable outcome in SICH patients. Traumatic ICH, therefore, appears to carry a better prognosis than SICH. A factor that may contribute to this difference is the younger age of TICH patients. In our study, similar results were obtained and TICH had an even better prognosis than that is in the literature and the same conclusions were reached [(8)]:

1. Traumatic hematomas have a better prognosis.
2. The younger the age, the better the prognosis.
3. The better GCS at presentation, the better the prognosis.

It is worth noting that up till now, there is a huge debate on the protocol of surgical management of SICH [(12)].

In our study mean GCS for better outcome in TICH was 10 and our patients had a favourable outcome after surgery as two patients were GOS (4) with moderate disability and two patients were GOS (5) with minor deficit (good recovery) ***Matheisen et al.***[(13)] found that patients of TICH with an admission GCS of at least 6 and a lesion volume of at least 20 ml who had surgery without previous neurological deterioration had significantly better outcomes than those who did not have surgery nor had surgery after deterioration.

In our study all patients had a favourable outcome as we operate at GCS 8-12 within the first 24 hours and they were just 4 patients. ***Choksey et al.*** [(14)] found that 38% of patients with a low GCS and a volume of the TICH >16 ml who had surgery had a poor outcome.

Surgical Trial In Traumatic Intracerebral Hemorrhage STITCH (TRAUMA) by ***Gregson et al.***[(8)] between December 2009 and September 2012, 170 patients, 82 eligible patients assigned to early surgery and 86 eligible patients assigned to initial conservative treatment. Patients ranged in age from 16 to 83 years with a median age of 50 years (in our study was 20 years), and 122 (73%) were male (our study was 100%). At the time of randomization, 70 (42%) patients had a Glasgow Coma Score [(GCS) of 13–15], 78 (46%) a [GCS of 8–12] and 20 (12%) a [GCS of < 8]. In our study GCS was (8-12). The volume of the largest haematoma varied between 10 and 97 ml (in our study hematoma size varied between 30 and 50 cm^3). Of the 82 patients in the Early Surgery group, only 61 (74%) had surgery, 57 (93%) of these within 12 hours of randomization (in our study was(75%).The STITCH (TRAUMA) trial has demonstrated a large reduction in mortality associated with early surgery for parenchymal TICH. Fifty-two (63%) Early Surgery patients had a favourable outcome on the Glasgow Outcome Scale (in our study was 100%), and there were no vegetative survivors.

The favourable outcome of SICH in our study was (50%). In the Surgical Trial in Intracerebral Hemorrhage (STICH) [(7)], the largest multicenter randomized controlled trial of surgery for SICH, the favourable outcome was (26%), as in our study we operate most of cases at a better GCS with a lower median age and a smaller sample size.

The unfavourable outcome of the spontaneous lobar ICH in the early surgery group operated by our team was lower than STICH [(12)] (8/16)(50%) three cases died (18.75%) and 8 cases had favourable outcome (50%) 5 with moderate disability and 3 with good recovery. The Surgical Trail in Lobar Intracerebral Hemorrhage (STICH II) included that 59% of the patients in the early surgery group had an unfavorable outcome.

In our study DM was more common with SICH (12.5%) than TICH with no significant relationship between DM and ICH. ***Hesami et al.*** [(15)] in case-control study, the prevalence of diabetes mellitus were evaluated in 120 patients presenting with intracerebral hemorrhage and the conclusion was that no significant relationship was found between diabetes mellitus and intracerebral hemorrhage.

Retrospective study by ***Hayes et al.***[(16)] of the 25 patients who underwent surgery for lobar ICH, decompressive craniectomy was performed in

8 and craniotomies were performed in 17(in our study twenty patients of surgical lobar ICH, decompressive craniectomy were performed in three patients and craniotomies were performed in seventeen patients). Patients with lobar ICH who underwent decompressive craniectomy had greater preoperative midline shift (as our study) and there were no significant differences, or strong trends toward differences, in any of the clinical or radiographic outcomes between patients with lobar SICH who had undergone decompresive craniectomy and those who had undergone craniotomy, the decision whether to perform craniotomy or decompresive craniectomy should be individualized to the patient, considering factors such as the hematoma size, degree of midline shift, and intraoperative brain swelling (as we reported in our study but the decompressive craniectomy had better outcome than craniotomy).

Patients with haematomas less than 50 ml had a better prognosis than others had a bigger size among both traumatic and spontaneous cases included in our study, The STICH II [(12)] also confirmed that the smaller the size the better the prognosis.

Finally, we noticed that the patients with low platelet count and patients with AP therapy had an unfavourable outcome with a percent of 18.75%. This point must undergo more trial of researches.

CONCLUSION

This concludes that both TICH and SICH have different features and that TICH have a much better prognosis than SICH. Aggressive management and surgical intervention is therefore more justified for TICH. As for SICH, it is suggested that management should be tailored and individualized for each patient depending on the specific clinical condition of the patient and expertise of the treating physician.

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