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Subdural Hygroma: Different Treatment Modalities and Clinical Outcome

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Abstract

Background: ***Subdural hygroma*** (SDHy) is a collection of cerebrospinal fluid (CSF) under the dural membrane. It is usually asymptomatic but may alter consciousness. Management is still a matter of controversy (conservative Vssurgical) especially when consciousness is a concern. **Aim:** To assess the different treatment modalities of SDHy regarding the patients' characteristics and clinical outcome, finding out the significant differences and the future recommendations. **Patients and Methods:** In this prospective one-year clinical case study, thirty patients were included. Patients' sociodemographic and clinical characteristics were analyzed. Fifteen patients were managed conservatively whereas the rest were managed surgically. Outcome was correlated with the patients' characteristics. **Results:** Twenty four men (80%) and 6 women (20%). Mean age = 25.2 years old. Hygroma was unilateral in 63.3% and fronto-parietal in 60% of patients. The most frequent concomitant injuries were brain contusions (50%) and subarachnoid hemorrhage (33.3%), respectively. The conservative group was treated symptomatically. The surgical group had burr hole evacuation (12 patients) and subdural peritoneal shunt (3 patients). No statistical significance in outcome in either group, but surgical group showed better outcome (73.3%) than conservative group (53.3%). Younger patients have good outcome (65%) compared to (55.3%) in old patients. Patients with severe GCS showed poor outcome (8/8 patients, 100%), whereas mild and moderate GCS patients showed good outcome (19/22 patients, 86%). **Conclusion:** SDHy though is a benign lesion its management is a matter of controversy. The decision of surgery is affected by GCS and neurological deterioration. Generally, the surgical option is more favorable but the conservative option should be the role as far as there is no concern on consciousness.

Keywords

Subdural Hygroma, Surgery, Conservative, Glasgow Coma Score

1. Introduction

The term subdural hygroma (SDHy) was first introduced in 1934 by Dandy [1]. It is a collection of cerebrospinal fluid (CSF), without blood, located under the dural membrane. It is commonly seen in elderly patients after minor trauma but can also be seen in children after infection [1] [2].

In 1819, a subdural fluid collection after head injury was described by Pott. In 1916, Payr *et al.* presented four cases of subdural hygroma which were post traumatic and his original description was recorded under the name "meningitis serosa truamatica" [3] [4].

Generally subdural space does not exist normally but a mild trauma can separate the space between dura mater and arachnoid mater creating a new space [5] which includes an interface layer composed of an arachnoid barrier layer and a dura border cell layer [6].

There are different causes that may develop subdural hygroma. Traumatic brain injury still remains an important concern and one of the leading causes of subdural hygroma and comprises 5% - 20% of post-traumatic space-occupying lesions [2] [5]. Fate of traumatic subdural hygroma is classified into resolution, steadiness, development and evolution according to findings on computed tomographic scan [7].

Other causes of subdural hygroma include, spontaneous subdural hygroma that may occur due to rupture of arachnoid cyst, and post-operative that develops after decompressive craniectomy, cranioplasty or shunt installation [4] [8]. Subdural hygroma may also develop in infants after infection where it may be misdiagnosed as subdural empyema [6].

There is no specific symptomatology attributed to SDHy, the vast majority of patients are asymptomatic and the diagnosis is almost always discovered during brain neuroimaging. Some uncommonly reported symptoms include headaches, changes in mental status, nausea and vomiting, focal neurological deficits and seizures [5]. Sometimes, it may cause mass effect and become a life-threatening condition [8]. CT brain is the basic diagnostic neuroimaging study but advanced neuroimaging studies are occasionally needed [8].

Management of SDHy is still a matter of controversy; many neurosurgeons suggest that the conservative treatment is the first option and that the surgical option is indicated when the mass effect and unfavorable clinical manifestations occur namely in the development or evolution types of SDHy [9] [10]. The objective of this prospective one-year clinical case study is to assess the different treatment modalities of SDHy (conservative and surgical) regarding the patients' characteristics and clinical outcome, finding out the significant differences and the future recommendations.

2. Patients and Methods

This is a prospective one-year clinical case study involved 30 patients suffering subdural hygroma who were admitted to Assiut University Hospital during the

period from November 2016 to November 2017.

Inclusion criteria:

All cases of subdural hygroma.

Exclusion criteria:

Patients with brain atrophy and cerebral palsy.

Patients who refused surgical open when indicated.

Patients with unavailable clinical or radiological data.

They were divided into two equal groups according to the type of management they have received (conservative or surgical). Patients' characteristics including age, sex, mechanism of injury, clinical presentation and consciousness level (Glasgow coma scale {GCS}) at admission were studied and analyzed. Initial neuroimaging study of patients was performed through CT scan which was repeated during hospital stay. Information such as site of subdural hygroma, time of formation and presence of other concomitant brain damages were studied. The choice of treatment option depended on our judgment to clinical symptoms and signs. As a rule, the conservative treatment was our first treatment option and the surgical option was performed on the basis of GCS and the neuroimaging findings (Volume, location, mass effect, and degree of midline shift). In patients that were treated conservatively, there were no specific medications administered for subdural hygroma apart from close observation of the conscious level and blood electrolytes, and control of epilepsy. In patients who underwent surgery, 12 patients (80%) had burr hole drilling and drainage of the hygroma while 3 patients (20%) had subdural peritoneal shunt insertion and drainage. The clinical outcome was evaluated based on Glasgow Outcome Score system (GOS) at time of discharge and classified into five groups such as good recovery (stage 1), moderate disability (stage 2), severe disability (stage 3), persistent vegetative state (stage 4), and death (stage 5).

The data were then analyzed using Statistical Package for the Social Sciences (SPSS) software (version 20). Chi-square test was used for statistical analysis. Probability values of ($P < 0.05$) were considered statistically significant.

3. Case Report

Male child, 7 years old presented with persistent headache and vomiting of 3 days duration, no history of trauma.

On examination:

Patient was fully conscious with no neurological deficits. MRI brain showed right cerebral crescent-shaped lesion (**Figure 1**).

Rt burr hole craniotomy with evacuation of the hygroma was done. The patient showed mederate clinical improvement, but suffered clinical deterioration two weeks later. CT brain was done to show recurrence or incomplete drainage of the hygroma (**Figure 2**).

The decision was to insert a right cysto-peritoneal shunt after which the patient showed marked improvement. Post shunt CT brain showed marked reduction in the size of the hygroma (**Figure 3**).

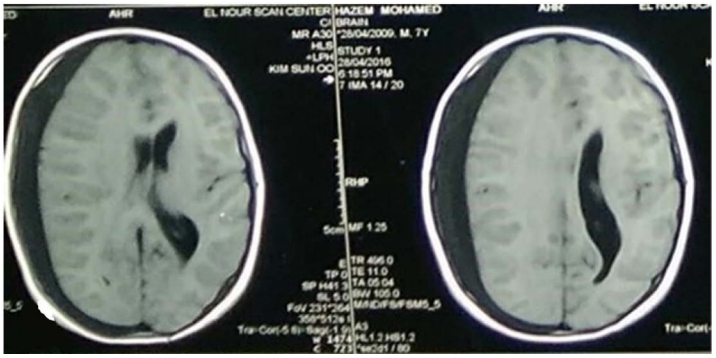

Figure 1. Non-contrast MRI brain axial view was done to show right cerebral crescent-shaped T1-hypointense homogenous SDHy.

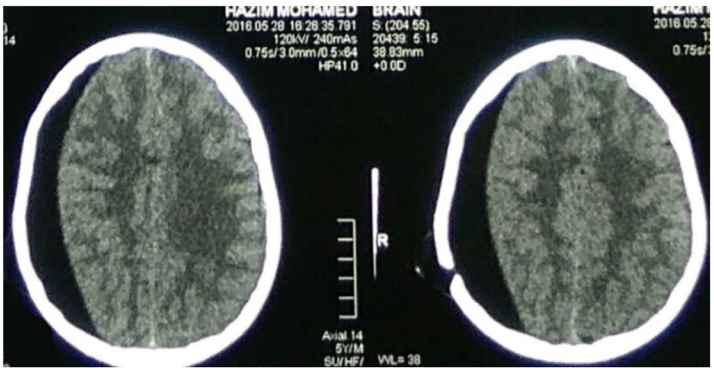

Figure 2. Non-contrast CT brain showing recurrent Rt cerebral crescent-shaped subdural hygroma.

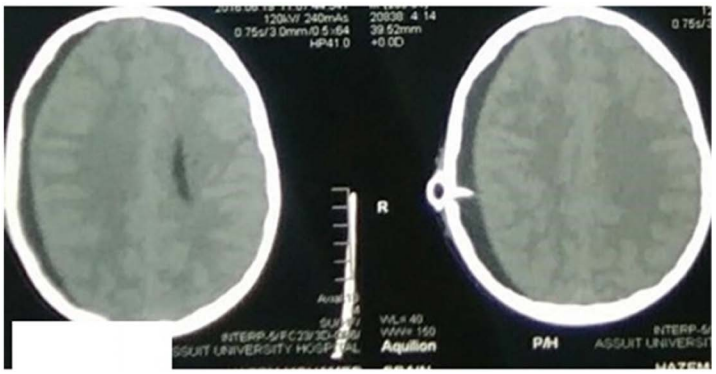

Figure 3. Post shunt CT brain showing marked reduction in the size of the hygroma.

4. Results

4.1. Patients Characteristics at Time of Presentation

Thirty patients with subdural hygroma were included in this study, 24 were men (80%) and 6 were women (20%), their ages ranged from one month to 78 years old (Mean age = 25.2, SD ± 22.8 years) (Table 1). The etiology of SDHy was head trauma in almost half of patients (46.7%), post-operative in 30% of patients, post-meningitic in 13.3%, congenital in 6.7% and spontaneous in 3.3% of patients.

The clinical signs and symptoms included altered of conscious level (70%), neurological deficits (36.7%), convulsion (13.3%), nausea and vomiting (10%) and headache (13.3%). The Glasgow Coma Scale (GCS) was severe in 26.7% of patients (GCS = 3 - 8), moderate in 26.7% (GCS = 9 - 12) and mild in 46.6% (GCS = 13 - 15) (Table 1).

Each patient underwent at least three CT examinations when hospitalized. Subdural hygroma was diagnosed by using CT scans in which a crescent shape hypodense area was detected. The main time for formation of hygroma was 18 days post traumatic. On neuroimaging, SDHy was found to be fronto-parietal in location in 60% of patients, frontal in 23.7% of patients, parietal in 10% of patients, and to be fronto-temporal in 6.6% of patients. Also, SDHy was unilateral in 63.3% (30% of hygroma were right and 33.3% were on left side) and bilateral in 36.7% of patients (Table 1).

Furthermore, most concomitant brain injuries in CT scans included brain contusion (50%), subarachnoid hemorrhage (33.3%), epidural hematoma (13.3%), acute subdural hematoma (13.3%), and intra-ventricular hemorrhage (16.7%) (Table 1).

Table 1. Patients characteristics at time of admission.

Patients characteristics	Number of patients (%)
Sex Male	24 (80%)
female	6 (20%)
Age Range	1 month - 78 years
Mean ± SD	(25.2 ± 22.8)
Etiology of SDHy Traumatic	14 patients (46.7%)
Post-operative	9 patients (30%)
Post-meningitic	4 patients (13.3%)
Congenital	2 patients (6.7%)
Spontaneous	1 patient (3.3%)
GCSMild (13 - 15)	14 patients (46.6%)
Moderate (9 - 12)	8 patients (26.7%)
Severe (3 - 8)	8 patients (26.7%)
Clinical presentations	
Disturbed Conscious Level	21 patients (70%)
Neurological deficit	11 patients (36.7%)
Seizures	4 patients (13.3%)
Neuroimaging findings (site)	
Fronto-parietal	18 patients (60%)
Frontal	7 patients (23.4%)
Parietal	3 patients (10%)
Fronto-temporal	2 patients (6.6%)
Unilateral	19 patients (63.3%)
Bilateral	11 patients (36.7%)
Concomitant brain injuries	
Brain Contusions	15 patients (50%)
Sub Arachnoid Hemorrhage	10 patients (33.3%)
Acute Subdural Hematoma	4 patients (13.3%)
Intra-Ventricular Hemorrhage	5 patients (16.7%)

4.2. Relations between Patients Characteristics and Type of Management and Outcome

This study considered all patients who had afflicted by subdural hygroma either treated conservatively or surgically evacuated. In patients that treated conservatively, there were no specific medications administered for subdural hygroma. In patients who underwent surgery, 12 patients (80%) had burr hole evacuation of the hygroma while 3 patients (20%) had subdural peritoneal shunt. Clinical outcome was evaluated based on GOS at time of discharge. The attributed scores were as follows: death (1), vegetative state (2), severe disability (3), moderate disability (4) and complete recovery (5). For statistical purposes, outcomes 1, 2 and 3 were considered **bad** outcome while outcome 4 and 5 were considered as **good** outcome.

Regardless of the type of management, good outcome with mild or moderate disability was encountered in (63.3%) of our patients. While bad outcome was encountered in 11 patients (36.7%) (severe disability 3, vegetative 6, and 2 patients have died).

In conservative group, 53.3% of patients had good outcome and 47.6% of patients had bad outcome. In surgical group, 73.3% of patients had good outcome while 26.7% had bad outcome (Table 2).

No statistical significance appears in the relationship between type of management of SDHy and the outcome. But surgical group shows noticeable good outcome (73.3%) rather than conservative group (53.3%).

Regarding the age factor, our patients were divided into two age group: In our study, **Group 1** (patients ≤ 40 years old) (23/30 patients), the outcome was good in 15/23 patients (65%) regardless the type of management. They were 6/10 patients (60%) in the conservative group and 9/13 patients (69%) in the surgical group. **Group 2** (patients > 40 years old) (7/30 patients), the outcome was good in 4/7 patients (57%) regardless of the type of management. They were 2/5 patients (40%) in the conservative group and 2/2 patients (100%) in the surgical group. It seems that young patients (≤40 years old) have good outcome regardless type of management as 65% have good outcome while (55.3%) of older group (>40 years old) have good outcome (Table 3).

Regarding GCS factor and its relation to the type of management and outcome. In patients with mild GCS (14 patients), 5 patients were managed conservatively with good outcome in all of them while 9 patients were managed surgically with good outcome in all of them. In patients with moderate GCS (8 patients), 5 patients were managed conservatively with good outcome in 3 of them and bad outcome in the remaining two patients, while 3 patients were managed surgically with good outcome in 2 of them and bad outcome in the remaining one patient. In patients with severe GCS (8 patients), 5 patients were managed conservatively with bad outcome in all of them, while 3 patients were managed surgically with bad outcome in all of them. Regardless of the type of management, good outcome with mild or moderate disability was encountered in (63.3%) of our patients. While bad outcome was encountered in 11 patients

(36.7%) (severe disability 3, vegetative 6, and 2 patients have died). It seems that clinical outcome depends mainly on the degree of GCS at time of admission regardless type of management. All 8 cases with severe GCS showed poor outcome in both groups of management. Whereas patients with mild and moderate GCS showed good outcome (19/22 patients, 86%) regardless of type of management they had (Table 4).

Regarding the clinical presentation factor and its relation to the type of management and outcome. In patients with neurological deficits (11 patients), 5 patients were managed conservatively with good outcome in one patient and bad outcome in 4 patients, while 6 patients were managed surgically with good outcome in 3 of them and bad outcome in the remaining 3 patients. In patients with seizures (4 patients), 2 patients were managed conservatively with good outcome in both of them, while 2 patients were managed surgically with good outcome in both of them. In patients with disturbed conscious level (21 patients), 12 patients were managed conservatively with good outcome in 5 patients and bad outcome in 7 patients, while 9 patients were managed surgically with good outcome in 5 of them and bad outcome in the remaining 4 patients (Table 5).

Regarding the associated pathology factor and its relation to the type of management and outcome. In patients with brain contusions (15 patients), 9 patients were managed conservatively with good outcome in 4 patients and bad outcome in 5 patients, while 6 patients were managed surgically with good outcome in 5 of them and bad outcome in the remaining one patient. In patients with subarachnoid hemorrhage (10 patients), 7 patients were managed conservatively with good outcome in 3 patients and bad outcome in 4 patients, while 3 patients were managed surgically with good outcome in all of them. In patients with intra ventricular hemorrhage (5 patients), 3 patients were managed conservatively with bad outcome in all of them, while 2 patients were managed surgically with good outcome in one of them and bad outcome in the remaining one patient. In patients with acute subdural hematoma (4 patients), 2 patients were managed conservatively with good outcome in one patients and bad outcome in the remaining one patient, while 2 patients were managed surgically with good outcome in one patient and bad outcome in the remaining one patient (Table 6).

Regarding the relation between the incidence of complications and the type of management (Table 7). In our study there were 9 patients suffered complications, two in the conservative group and 7 patients in the surgical group. SDHy recurrence has occurred in 4 patients of the surgical group after burr hole evacuation of hygroma.

Table 2. Relationship between type of management and clinical outcome.

Outcome	No.	Conservative management (n = 15)		Surgical management (n = 15)		P value
		No.	%	No.	%	
Good	19	8	53.3	11	73.3	0.256
Bad	11	7	46.7	4	26.7	

Table 3. Relationship between age of patients, type of management and outcome.

Age	Number	Type of treatment									
		Conservative (n = 15)					Surgical (n = 15)				
		good (n = 8)		bad (n = 7)		P value	good (n = 11)		bad (n = 4)		P value
		No.	%	No.	%		No.	%	No.	%	
≤40 years	23	6	75.0	4	57.1	0.855	9	81.8	4	100.0	0.954
>40 years	7	2	25.0	3	42.9		2	18.2	0	0.0	

Table 4. Relationship between GCS, type of management and outcome.

	No.	Type of treatment								
		Conservative (n = 15)					Surgical (n = 15)				
		good (n = 8)		bad (n = 7)		P value	good (n = 11)		bad (n = 4)		P value
		No.	%	No.	%		No.	%	No.	%	
GCS											
Less than 8	8	0	0.0	5	71.4		0	0.0	3	75.0	
9 - 12	8	3	37.5	2	28.6	0.006*	2	18.2	1	25.0	0.003*
13- 15	14	5	62.5	0	0.0		9	81.8	0	0.0	

GCS = Glasgow Coma Score * = Statistical Significant, p value = Probability value.

Table 5. Relationship between clinical presentation of patients, type of management and outcome.

Clinical picture	No.	Type of treatment								
		Conservative (n = 15)					Surgical (n = 15)				
		good (n = 8)		bad (n = 7)		P value	good (n = 11)		bad (n = 4)		P value
		No.	%	No.	%		No.	%	No.	%	
Fits	4	2	25.0	0	0.0	0.5	2	18.2	0	0.0	0.95
Neurological deficit	11	1	12.5	4	57.1	0.2	3	27.3	3	75.0	0.28
Disturbed Conscious level	21	5	62.5	7	100.0	0.24	5	45.5	4	100.0	0.19

Table 6. Relationship between associated pathology, type of management and outcome.

Associated pathology	No.	Type of treatment					
		Conservative (n = 15)			Surgical (n = 15)		
		good (n = 8)	bad (n = 7)	P value	good (n = 11)	Bad (n = 4)	P value
		No. (%)	No. (%)		No. %	No. %	
SAH	10	3 (37.5)	4 (57.1)	0.80	3 (27.3)	0 (0)	0.66
ASDH	4	1 (12.5)	1 (14.3)	0.50	1 (9.1)	1 (25)	0.95
Brain contusions	15	4 (50)	5 (71.4)	0.75	5 (45.5)	1 (25)	0.90
IVH	5	0 (0)	3 (42.9)	0.15	1 (9.1)	1 (25)	0.95

SAH = Subarachnoid Hemorrhage ASDH = Acute subdural Hemorrhage IVH = Intra-ventricular Hemorrhage.

Table 7. Relationship between complications and type of management.

Complications	Conservative management (n = 15)		Surgical management (n = 15)	
	No.	%	No.	%
	2	13.3	7	46.6
CSF leak	0 (0%)		2 (25%)	
Infection (*brain abscess*)	1 (50%)		0 (0%)	
Massive IVH	1 (50%)		0 (0%)	
Hydrocephalus	0 (0%)		1 (12.5%)	
Recurrence	0.0		4 (57.2%)	

CSF = Cerebrospinal Fluid, IVH = Intra-ventricular Hemorrhage.

CSF leak has occurred in 2 patients one after burr hole evacuation and the other after shunting. CSF leak has stopped by medical treatment and daily dressing without need for surgical intervention.

Brain abscess occurred in one case in the conservative group. It has developed as a complication of compound depressed fracture. Hydrocephalus has developed in one case after burr hole evacuation that ended by death of the patient as shunt surgery refused by the relatives (Table 7).

5. Discussion

Subdural hygroma (SDHy) is mostly asymptomatic and has a regressive course, but sometimes, it may cause mass effect and become a life-threatening condition requiring surgical intervention [8]. In this study, alteration of the conscious level, neurological deficits and seizures were the main clinical presentation (70%, 36.5% and 13.5% respectively). Yousef-Zadeh *et al.* [11] reported alteration of conscious level and neurological deficit as the main presentation (62.5%) and headache in 50% of their patients. In the present study, 73.3% of our patients were below 40 years; this characterizes a younger and prevalent population. Zanini *et al.* [12] have reported close results with 50% of their patients aged between 16 and 40 years. Rambarki *et al.* [13] also have reported that most of their patients aged between 10 - 50 years of age as a late complication of head trauma.

For different authors, subdural hygroma is more prevalent in older patients with some degree of cerebral atrophy [14] [15].

Regarding the gender, males to females percentage was 80% to 20% in our study Hamamoto *et al.* [16] also reported predominance of males by 82.3% in his study. Domination of males may be related to the fact that they are more liable to trauma than females because of the type of work and nature of lifestyle they both have.

In our study, head trauma was noticed to be the main etiology of SDHy formation in 46.7% of studied patients. Hamamoto *et al.* [16] also reported that 76.5% of his patients were post traumatic. The pathogenesis of this condition is

not well understood. Some theories have claimed it to the formation of a one-way valve allowing the passage of CSF into the subdural space, caused by a traumatic tear of the arachnoidal mater or due to the rupture of an existing arachnoids cyst [17]. Other theories claimed it to the presence of underlying parenchymal or vascular pathology that causes a passive effusion into the subdural space [18], while others claimed it to the new formation of subdural vascularized neomembranes with increased permeability of CSF in the arachnoids membrane due to the increasing transmembrane pressure gradient [19].

As regard the location of SDHy on neuroimaging, SDHy was reported to be on the frontal and fronto-parietal region in 73.6% of our patients. Lee *et al.* [20] has reported similar results as 77% of hygromas were found in fronto-parietal region of his patients and he explained that by the effect of earth gravity on brain. As most patients lie on their back, the shrunken brain gravitates toward occipital area and therefore SDHy is formed in frontal area [20].

In our study, SDHy was reported to be unilateral in 19 patients (63%) and bilateral in 11 patients (36%). Yousef-Chabok *et al.* [21] reported similar results in their study as they reported SDHy to be unilateral in 81.2% of patients and bilateral in 18.8% patients. But Lee *et al.* [20] reported that SDHy occurred bilaterally in 70% of his patients. Caldarelli *et al.* [10] also reported that the collections were bilateral in (53%) and were unilateral in (47%) of their patients.

Regarding the associated pathologies with SDHy, we reported that brain contusions were found in (50%) of our patients and subarachnoid hemorrhage was found in (33.4%) of them. In Liu *et al.* [7] study, most accompanying cranial pathologies were brain contusions followed by subarachnoid hemorrhage. Same results were reported by Yousef-Chabok *et al.* [21] as contusions were reported in 25% of their patients while subarachnoid hemorrhages were reported in 18.8% of their patients.

The association of subarachnoid hemorrhage and SDHy is explained as CSF flows caudally into the spinal subarachnoid spaces, rostral into the basal cisternal spaces and dorsally into the subarachnoid spaces over the cortical convexities and cerebellum. The subarachnoid hemorrhage alters the dynamics of CSF circulation and may cause brain damage leading to Blood Brain Barrier failure with accumulation of CSF in subdural space and formation of SDHy in patients with subarachnoid hemorrhage [21].

Regarding the severity of brain insult which was assessed by Glasgow coma score (GCS), our patients were divided into 3 groups. Severe brain damage (GCS ≤ 8) that was encountered in 8 patients (26.7%), moderate brain damage (GCS 9 - 12) in 8 patients (26.7%) and mild brain damage (GCS 13 - 15) in 14 patients (46.6%). Yousef-Chabok *et al.* [21] reported that (18.7%) of their patients had severe brain damage, (50%) had moderate brain injury, and (31% 3) had mild brain damage.

According to the type of management our patients had received, they were divided into 2 equal groups with 15 patients in each group. One group had conservative management while the other one had surgical management. The clini-

cal outcome was assessed by the Glasgow Outcome Score (GOS) as good or bad outcome. Regardless of the type of management, good outcome with mild or moderate disability was encountered in (63.3%) of our patients. While bad outcome was encountered in 11 patients (36.7%) (severe disability 3, vegetative 6, and 2 patients have died). Yousef-Chabok *et al.* [21] reported that (18.8%) of their patients had good outcome with no or mild disability, (75%) had good outcome with moderate disability, and (6.3%) had bad outcome with severe disability. Regarding the type of management in our study, the surgical group showed more favorable outcome than the conservative group as 11/15 patients (73.3%) had good outcome in the surgical group, while 8/15 patients (53.3%) had good outcome in the conservative group. Some authors reported that the conservative methods of management are the appropriate one as most of the hygromas resolve spontaneously [5] [22]. Others indicated that surgical methods of management are more appropriate especially in patients with mass effects and disturbed conscious level [23].

Age plays an important role as a prognostic factor of SDHy. It is noticeable that younger patients showed good outcome than elderly ones. But yet it did not reach a statistical significance. It may be related to low presentation of elder patients (23%) in our study that already involves a small total number of patients. In our study, **Group 1** (patients ≤ 40 years old) (23/30 patients), the outcome was good in 15/23 patients (65%) regardless of the type of management. They were 6/10 patients (60%) in the conservative group and 9/13 patients (69%) in the surgical group. **Group 2** (patients > 40 years old) (7/30 patients), the outcome was good in 4/7 patients (57%) regardless of the type of management. They were 2/5 patients (40%) in the conservative group and 2/2 patients (100%) in the surgical group. Many authors reported similar results with a high percentage of good outcome in the younger groups of patients [11] [21].

Severity of brain injury at time of admission is the main factor in determining clinical outcome of the patients regardless of the type of management, as shown in **Table 4**. It seems that clinical outcome depends mainly on the degree of GCS at time of admission regardless type of management. All 8 cases with severe GCS showed poor outcome in both groups of management. Whereas patients with mild and moderate GCS showed good recovery (19/22 patients, 86%) regardless of type of management they had (**Table 4**). Many authors reported similar results with a high percentage of good outcome in patients with mild and moderate Glasgow Coma Score [11] [21] [24]. Other factors as age, gender, site of SDHy or associated pathology had not yet reached a statistical significant value in determining the clinical outcome or even the type of management of patients with subdural hygroma.

6. Conclusions

Subdural hygroma is a benign lesion that may resolve spontaneously or with medical treatment. Its management is a matter of controversy. When the con-

scious level is a concern, surgical management should be considered. But the decision of surgical management may be affected by multiple factors especially GCS, neurological deterioration, and midline shift on neuroimaging. Generally, the surgical management option of SDHy is more favorable but the conservative management option should be the role as far as there is no concern on the patient's conscious level.

Although we did not find a statistically significant difference between the surgical and the conservative management options for SDHy, there is a trend towards the surgical option when the conscious level is a concern.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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