

Comparative Study between Conservative and Surgical Management of Intraventricular Hemorrhage

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Abstract

Background: Intraventricular (IVH) occurs frequently in concurrence with intracranial (ICH) and subarachnoid hemorrhage (SAH). IVH can vary between a mild trace to complete filling of all ventricles. External ventricular drainage (EVD) is the treatment of choice for symptomatic hydrocephalus associated with IVH and may help in clearance of blood. It is controversial in the setting of poor GCS or fair GCS (more than 10).

Aim of Study: This study focuses on the management of IVH in patients with fair GCS (>10). Conservative treatment is assessed as a possible alternative in the management of IVH.

Patients and Methods: Retrospective analysis was performed for adult patients with intraventricular hemorrhage in Kasr El-Aini and Beni-Suef University Hospitals during the period between February 2019 and February 2021 who were managed either conservatively or surgical. The study included patients with GCS more than 10. Good outcome was defined when GCS improved at discharge 2 points or more.

Results: This study included 78 patients. They were divided into two groups; group A Conservative management and group B Surgical management by EVD. Group A included 40 patients. The Graeb score was mild (1-4) in 10 (25%) patients, moderate (5-8) in 22 patients (55%) patients, and severe (9-12) in 8 (20%) patients. There was associated ICH in 23 (58%) patients, and no ICH in 17 (43%) patients. The outcome was good in 36 (90%) cases and 4 (10%) cases died. Group B included 38 cases. The Graeb score was mild (1-4) in 5 patients (13%) in, moderate (9-12) in 20 (53%), and severe (9-12) in 13 patients (34 %). Secondary intraventricular hemorrhage was found in 32 (84%) of cases & primary intraventricular hemorrhage (without intracerebral hemorrhage) in 8 (21%). The outcome was good in 23 cases (61%) and 15 cases (39%) died. CSF infection occurred in 10 patients (26%).

Conclusion: Conservative management of IVH appears to have a better outcome in comparison with external drainage in patients with fair GCS (>10) and it can prevent unwanted complications of EVD such as CSF infection.

Key Words: Intraventricular – Hemorrhage – Hydrocephalus.

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Introduction

INTRAVENTRICULAR (IVH) is considered among the common sequelae of intracranial (ICH) and subarachnoid hemorrhage (SAH). However, it can be primary occurring on its own. IVH can vary between a mild layer in the occipital horn of the lateral ventricle to complete filling of all ventricles. The finding of IVH in association with ICH or SAH usually leads to a worse prognosis. This is caused by the elevation of intracranial pressure (ICP) due to the impedance of the CSF flow in the ventricles and hydrocephalus [1-3]. The mere presence of blood in the third and fourth ventricles causes pathological changes in the hypothalamus and brain stem as found in Post-mortem specimens [4,5].

External ventricular drainage (EVD) is the treatment of choice for hydrocephalus associated with IVH and may help in clearance of blood. The decision is obvious in cases of symptomatic hydrocephalus i.e., decreased GCS. However, it is controversial in the setting of poor GCS or fair GCS (more than 10) [6,7]. This controversy may be raised by the added effects of ICH on the clinical condition [8]. The feasibility of conservative management becomes more crucial in this setting, especially with the possibility of CSF infection with EVD.

Aim of study:

This study focuses on the management of IVH in patients with fair GCS (>10). Conservative treatment is evaluated as a possible useful pathway in the management of IVH.

Abbreviations:

IVH : Intraventricular hemorrhage.
GCS : Glasgow Coma Scale.
EVD : External ventricular drain.

Patients and Methods

This study retrospectively analyzed patients with intraventricular hemorrhage in Kasr El-Aini and Beni-Suef University Hospitals during the period between February 2019 and February 2021. The study included adult cases of spontaneous intraventricular hemorrhage with superimposed hydrocephalus (Bicaudate index more than the 95th percentile for the age group) who were managed either conservatively or surgically [9]. Patients with GCS less than 9, post-craniotomy or brain tumor related IVH and post-traumatic IVH were excluded from the study.

Patients were managed in the ICU. Hypertension and other co-morbidities were noted. They were examined for the level of consciousness every hour by GCS. Presence of weakness was noted. CT scan was performed on admission and after 7 days. The images were examined for the presence of intracerebral hemorrhage (deep or lobar), amount of IVH according to Graeb score (3). Digital Subtraction Angiography was performed on suspicion of aneurysms or arteriovenous malformations.

If surgery was decided, and EVD was placed usually into the frontal horn. The choice of the side of insertion whether right or left was made according to surgeon's preference. The drainage chamber was adjusted to 5cm H₂O. Patients received prophylactic antibiotics in the form of ceftriaxone one hour before surgery and continued during the time of drainage. CSF samples were obtained every 48 hours and examined for bacterial infection. The type of EVD used was either by Medtronic Becker® External drainage and monitoring system or an improvised tubing system.

Good outcome was defined when GCS improved at discharge 2 points or more with respect to time of admission. Poor outcome was defined as no improvement or deterioration of GCS and death.

Results

This study included 78 patients who fell into the inclusion criteria. They were divided into two groups; group A Conservative management and group B Surgical management by EVD (Table 1).

Group A:

This group included 40 patients. This group included 40 patients. There were 30 (75%) males, and 10 (25%) patients were females. The mean age was 57.12 years old. Thirteen (33%) patients were diabetic, 27 (68%) patients were hypertensive, and 4 (10%) patients were both diabetic and hy-

pertensive. The Graeb score was mild (1-4) in 10 (25%) patients, moderate (5-8) in 22 patients (55%) patients, and severe (9-12) in 8 (20%) patients. There was associated ICH in 23 (58%) patients, and no ICH in 17 (43%) patients. Follow-up CT brain was the same in 28 (70%) patients, showed increased blood in the ventricle in 6 (15%) patients, and decreased blood in 6 (15%) patients. Hemiparesis was noted in 22 (55%) patients, and no weakness in 18 (45%) patients. The outcome was good in 36 (90%) cases and 4 (10%) cases died. Spontaneous subarachnoid hemorrhage (SAH) was found in 3 cases (8%). CT angiography of the brain was done in 11 (28%) cases but was negative.

Table (1): Summary of Results.

Variable	Group A Conservative (n=40)	Group B EVD (n=38)
<i>Mean:</i>		
Age	57.12	54.2
<i>Sex:</i>		
Male	30 (75%)	25 (66%)
Female	10 (25%)	15 (34%)
<i>Chronic diseases:</i>		
DM	13 (33%)	24 (63%)
HTN	27 (68%)	30 (79%)
DM & HTN	4 (10%)	16 (42%)
<i>Graeb score:</i>		
Mild (1-4)	10 (25%)	5 (13%)
Moderate (5-8)	22 (55%)	20 (53%)
Severe (9-12)	8 (20%)	13 (34%)
<i>Associated ICH:</i>		
Present	23 (58%)	32 (84%)
Absent	17 (43%)	8 (21%)
<i>Follow-up CT scan:</i>		
Same	28 (70%)	25 (66%)
Increased	6 (15%)	5 (13%)
Decreased	6 (15%)	8 (21%)
<i>Hemiparesis:</i>		
Present	22 (55%)	32 (84%)
Absent	18 (45%)	6 (16%)
<i>Outcome:</i>		
Improved	36 (90%)	23 (61%)
Death	4 (10%)	15 (39%)
Angiography		1 ACOM aneurysm
CSF infection		10 (26%)

Group B:

There were 38 cases operated by external ventricular drain; 25 (66%) cases were males and 15 (34%) were females. The mean age was 54.2 years. Diabetes Mellitus was present in 24 cases (63%), hypertension in 30 cases (79%) and both present in 16 cases (42%). The Graeb score was mild (1-4) in 5 patients (13%) in, moderate (5-8) in 20 patients (53%) in, and severe (9-12) in 13 patients (34%) in.

(53%), and severe (9-12) in 13 patients (34 %). Secondary intraventricular hemorrhage (with intracerebral hemorrhage) was found in 32 (84%) of cases & primary intraventricular hemorrhage (without intracerebral hemorrhage) in 8 (21%). Follow-up CT brain was the same in 25 (66%) patients, showed increased blood in the ventricle in 5 (13%) patients, and decreased blood in 8 (21%) patients. CT angiography was done in 3 cases and one case revealed anterior communicating artery aneurysm. Hemiparesis was noted in 32 patients (84%), and 6 patients (16%) were intact. The outcome was good in 23 cases (61%) and 15 cases (39%) died. CSF infection was observed in 10 patients (26%).

Discussion

There exists no consensus on the indications for EVD placement in patients of IVH associated with non-symptomatic hydrocephalus. The recommendations of AHA and ASA approve EVD placement only if there is deterioration of the GCS less than 8 [10]. Some authors based their decisions according to the site and amount blood. A study advised EVD insertion even in absence of hydrocephalus when IVH blocks the third ventricle, to avoid the possible occurrence of obstructive hydrocephalus [11]. Another study adopted the same principle and bilateral EVDs were placed in the presence third ventricular obstruction by blood. However, they concluded that 10% of their cases might not have needed an EVD [6]. There is no proof with certainty that EVD is of value in cases of IVH with non-symptomatic hydrocephalus. The study by Hughes et al., advised observation of IVH even with global involvement of the ventricular system so long as hydrocephalus is asymptomatic. However, careful monitoring remains crucial [7].

The effect of EVD placement on the outcome in patients with IVH is mostly unsatisfactory in the literature. Shapiro et al., stated that EVD in cases of hemorrhagic dilatation of the 4th ventricle offers no benefit [5]. A study by Adams et al., of 22 patients concluded that EVD helps in reduction of ventricular size but does not improve the level of consciousness [12]. In the meta-analysis by Nieukamp et al., of 7 studies on IVH due to ICH or SAH, EVD had a minor impact on the case fatality rate in comparison with conservative treatment. They also concluded that there was no difference in the poor outcome in both [13]. Our study strikingly showed a higher mortality in the EVD group (39%) in comparison with the conservative group (10%). On the other hand, the study by Staykov et al., on 224 cases, reported an improvement in mortality after EVD placement (53%) in

relation to conservative management (71%) [14]. Herrick et al., reported a similar outcome [15].

The poor outcome in spite of CSF diversion by EVD may be explained by the presence of another pathology besides hydrocephalus [16]. Presence of clots in the third and fourth ventricles compress sensitive areas such as the brain stem, hypothalamus and thalamus. The greater the amount of blood in IVH the worse the prognosis [4]. Softening of the medulla and pons was observed on postmortem gross picture of IVH patients in addition to minute infarcts of the pons on microscopic picture the study by Shapiro et al., [5]. The metabolism of hemoglobin in the cells adjacent to the ventricles stimulates inflammation by cytokine production and induce apoptosis [17].

In the present study, CSF infection was reported in 26% of patients in the EVD group (10 out of 38 patients). This rate is relatively higher than in previous studies. In the meta-analyses by Lo et al. the rate of infection was 6.9% [18]. The study by Herrick et al., reported an incidence of 3.4% [15]. This complication can be avoided altogether by adopting conservative management if possible. This is especially important in the setting of low-income countries as in our institute. The high rate of CSF infection in our series may be attributed to the type of the EVD system used in some cases. Due to the high price of the EVD system, which poses a burden on the healthcare budget, we occasionally used an improvised system patients as previously described in literature [19].

Conclusion:

Conservative management of IVH appears to have a better outcome in comparison with external drainage in patients with fair GCS (>10). This calls for adoption of this treatment to avoid unwarranted burden on the healthcare system and unwanted complications of EVD such as CSF infection. Further studies are needed on a larger scale to help in outlining the best treatment protocol for this disease.

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دراسة مقارنة بين العلاج التحفظي والتدخل الجراحي للنزيف داخل بطنيات المخ

المقدمة : يحدث النزيف داخل البطين بشكل متكرر بالتوافق مع النزيف داخل الجمجمة والنزيف تحت الام العنكبوتية. يمكن أن يختلف كمية النزيف بين أثر خفيف لملء كامل لجميع البطنيات. التصريف البطيني الخارجي هو العلاج المفضل لاستسقاء الرأس المرتبط بأعراض وقد يساعد في إزالة الدم. ولكنه مثير للجدل في وضع درجة الوعي الضعيف أو المقبول (أكثر من ١٠).

الهدف من الدراسة : تركز هذه الدراسة على معالجة النزيف داخل البطين في المرضى الذين يعانون من درجة وعي مقبولة (<١٠).

طرق الدراسة ومكوناتها : يتم تقييم العلاج المحافظ كبديل محتمل في العلاج. تم إجراء تحليل بأثر رجعي للمرضى البالغين الذين يعانون من نزيف داخل البطين في مستشفيات قصر العيني وجامعة بنى سويف.

وقت الدراسة : خلال الفترة بين فبراير ٢٠١٩ وفبراير ٢٠٢١ والذين تمت معالجتهم إما بشكل متحفظ أو جراحي. شملت الدراسة المرضى الذين يعانون من درجة وعي أكثر من ١٠. تم تحديد النتيجة الجيدة عندما تحس درجة الوعي عند المغادرة ٢ نقطة أو أكثر.

حجم العينات : شملت هذه الدراسة ٧٨ مريضاً. تم تقسيمهم إلى مجموعتين. المجموعة A المعالجة المحافظة والمجموعة B المعالجة الجراحية بواسطة التصريف البطيني الخارجي. وشملت المجموعة (أ) ٤٠ مريضاً. كانت درجة غرايب خفيفة (١-٤) في ١٠ (٢٥٪) من المرضى، ومعتدلة (٥-٨) في ٢٢ مريضاً (٥٥٪) مريضاً، وشديدة (٩-١٢) في ٨ (٢٠٪) من المرضى. كان هناك نزيف داخل الجمجمة مرتبط في ٢٣ (٥٨٪) من المرضى، ولم يوجد في ١٧ (٤٣٪) من المرضى. وكانت النتيجة جيدة في ٣٦ حالة (٩٠ في المائة) وتوفيت ٤ حالات (١٠ في المائة). وشملت المجموعة B ٣٨ حالة. كانت درجة غرايب خفيفة (١-٤) في ٥ مرضى (١٣٪)، معتدلة (٩-١٢) في ٢٠ (٥٣٪)، وشديدة (٩-١٢) في ١٣ مريضاً (٣٤٪). تم العثور على نزيف ثانوي داخل البطين في ٣٢ (٨٤٪) من الحالات ونزيف أولى داخل البطين (بدون نزيف داخل المخ) في ٨ (٢١٪). وكانت النتيجة جيدة في ٢٣ حالة (٦١ في المائة) وتوفيت ١٥ حالة (٣٩ في المائة). حدثت عدوى السائل الدماغي الشوكي في ١٠ مرضى (٢٦٪).

معايير الاقصاء : درجة وعي المريض أقل من ٩ والنزيف الذي له علاقة بأورام المخ والنزيف الذي ما بعد.

معايير الانضمام : النزيف داخل بطنيات المخ الذي يحدث تلقائياً ليس بسبب ورم أو حادث.

التوصيات : يتضح أن المعالجة المحافظة للنزيف داخل البطين لها نتائج أفضل مقارنة بالتصريف الخارجي في المرضى الذين يعانون من درجة وعي مقبولة (<١٠) ويمكن أن تمنع المضاعفات غير المرغوب فيها للتصريف البطيني الخارجي مثل عدوى السائل الدماغي الشوكي.