Open Drainage in Chronic Subdural Hematomas: A Prospective Study of 189 Cases

Souad Bakhti [1*], Nabila Tighilt [2], Mohamed Djennas [3]

[1] MD, Professor, Pediatric Neurosurgery Division, Mustapha Pacha University Hospital, Algiers Algeria
[2] MD, Assistant Professor, Pediatric Neurosurgery Division, Mustapha Pacha University Hospital, Algiers, Algeria
[3] MD, Professor, Chief Department of Neurosurgery, Mustapha Pacha University Hospital, Algiers, Algeria

* Corresponding Author Address: Place 1er Mai, Algiers, Algeria. Tel: +213661411881. Fax: +213 23860025. Email: bak-sou@hotmail.com

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Abstract

Background & Importance: Chronic subdural hematoma (CSH) is one of the most frequent intracranial hemorrhages in adults. However, gold standard treatment of CSH is not yet defined. Since the 80's, closed drainage is a standard among techniques using drains because the open type has been incriminated in high rates of postoperative infections. However, closed drainage requires materiel which is sometimes not available or expensive in some countries. Open drainage was reintroduced in our department in the middle of the 90's because of economic crisis at this time. We have then conducted a prospective study to assess safety and efficacy of open drainage in treatment of CSH.

Case Presentation: A prospective study of adult patients with CSH was conducted from January 2008 to December 2011. All patients have the same surgical procedure which included one burr-hole craniostomy, spontaneous evacuation and open drainage. The study focused on infectious complications, postoperative seizures, and recurrences. Results are compared with those of literature.
In our study, 189 patients were operated with mean age of 69.2 years old. Of all, 163 patients were cured. Overall rate of complications was 15.34% with an infection rate of 1.58%, a postoperative seizure rate of 1.05% and a recurrence rate of 14.2%. Mortality rate was 5.8%. Results were in concordance with those of large series of literature.

Conclusion: Data of the current study suggested that open drainage is a safe and efficient method in treatment of CSH. It is also a cost-efficient treatment that could be very interesting for middle- and low-income countries.

Keywords: Chronic Subdural Hematoma; Open Drainage; Infection; Surgical Technique

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Background and Importance

Chronic subdural hematoma (CSH) is one of the most frequent intracranial hemorrhages (1). It is a common disease in the elderly (1,2). Its incidence increases gradually from 1 to 8.2 per 100.000 cases, each year in the sixth and seventh decades of life (3-7). The disease will be more frequent in coming years with increase of life expectancy (8,9). CSH is consecutive to trauma in a large proportion with a frequency varying from 56% to 80% (10-16). Other risk factors include coagulopathies, therapeutic anticoagulation, antiplatelet agents, alcohol abuse, epilepsy, and intracranial hypotension (6, 17-25). CSH has been described to arise in patients who had presented an acute subdural hematoma or hygroma (26-30); but the latter is more related to the disease. However, the real pathophysiology remains unclear. Although CSH is frequently observed, there is no gold standard for treatment. The most surgical techniques used are craniostomy by burr hole or twist drill with or without irrigation, and with or without drainage (2,4,25-43). Drainage seems to be a must for several authors (42,44-52). Closed system drainage is used since the mid of the 80's because open drainage had been incriminated in high rates of infection (53-56). Yet, closed drainage requires material which may be unavailable or expensive in some instances particularly in low- and middle-income countries. In our department, we have reintroduced the open drainage in the mid of the 90's because of economic crisis. We have observed good results and no increase of infections rate; that's why we have conducted a prospective study to assess safety and efficacy of open drainage.

Case presentation

General features

The prospective study was conducted from January 2008 to December 2011. A total of 189 consecutive patients were managed by the same protocol. Age of patients varied from 18 to 96 years with a mean age of 69.4 years old. There was a male predominance (76.1%). Of all, 113 patients had associated disease including cardiovascular disease, diabetes, anticoagulation therapy and neoplastic formations. Trauma was the most common etiology with a frequency of 70.5%. We did not find any etiology in 32 patients (16%). Patients were clinically assessed using the Markwalder's score (Table 1) and Glasgow coma scale. Grade 1 and 2 were present in 54% of cases, while grade 3 and 4 were present in 46% of them. All patients were explored by CT scan. The hematoma was bilateral in 20%. A total of 241 cavities were explored. The lesion was homogeneous (hypodense, isodense and hyperdense) in only 30.6%. The remaining cavities were heterogeneous (mixt, layered and compartmentalized).

Table 1. Distribution of Clinical Grades according to Markwalder's Grading

Markwalder's Grade	Number (%)
1	15 (7.9)
2	83 (43.9)
3	88 (46.5)
4	3 (1.5)

Management

All patients were operated after stabilization including resuscitation in some cases and normalization of coagulation parameters. Patients underwent surgery in the operative room. Surgery was performed under local anesthesia associated to sedation in 102 patients (53.9%). The other patients were operated under general or local anesthesia. During surgery, patients were placed in supine position with head elevated and rotated 30 degrees to opposite side in cases of unilateral lesions. The head was not turned in bilateral hematomas. Bilateral hematomas were all operated simultaneously. Surgery consisted of one burr hole made on the thickest part of the hematoma according to the preoperative CT scan. Dura was coagulated and incised. Outer membrane was then coagulated and divided. After spontaneous evacuation of the hematoma, the drain constituted by a finger of sterile glove was then inserted (Figures 1&2). Skin was closed afterward. Drainage was open in the dress.

Figure 1. Showing the Drain, a Finger Glove Split in Two

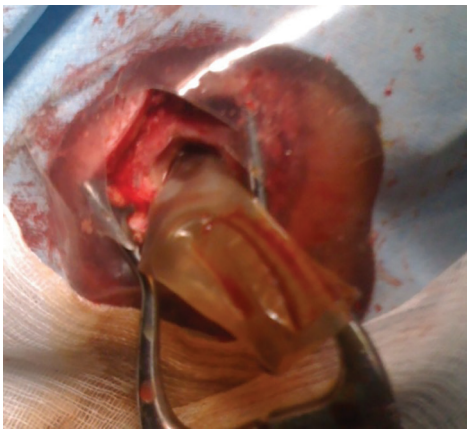

Figure 2. The Drain Introduced in a Burr Hole after Spontaneous Evacuation

In the postoperative period, patients were hyper hydrated intravenously with 2000 ml of glucose solution 5% every 24 hours during 48 hours. Patients were kept at flat bed rest during this period. The dress was not manipulated during the 48 postoperative hours. We did not use prophylactic anticonvulsant therapy. The drain was removed after 48 hours; and patients were then discharged. Postoperative CT scan was not done systematically and was reserved only for patients with no improvement or neurological worsening.

All patients underwent a clinical and radiological assessment at 1 month after surgery. Diagnosis of recurrence was made in patients who presented a reappraisal or a worsening of the symptoms with a consequent radiologic image. All cases were reoperated using the same technique. Follow-up of patients was continued till 6 months after surgery. Results were then collected.

Observation

A total of 29 patients presented postoperative complications with an overall rate of 15.34%. Some patients had more than one complication. Table 2 represents the different complications observed. Three patients presented acute subdural hematoma; all of them were reoperated. In all cases, bleeding was from the dura. Two of these patients died. Intraparenchymal hematomas were observed in 2 patients; all of them were medically managed. One of these patients died. Compressive pneumocephalus occurred in 4 cases; 2 patients were treated surgically and the 2 others by massive oxygentherapy. One of the patients treated surgically died. Infections were observed in 3 patients (1.58%); 2 of them, both with history of diabetes, had superficial wound infections and the third presented a meningitis. Infection was diagnosed within the first week after surgery in all cases. All patients with infectious complications were treated by intravenous antibiotherapy. The patient with meningitis also developed pneumonia and died despite an adapted treatment; he was 84 years old with a history of stroke. Postoperative seizures were observed in 2 patients (1.05%). The onset of seizure was within the 72 hours of surgery in the 2 cases. No complications due to traumatic handling of the drain were noticed. Postoperative mortality rate was 5.8% (11 patients). Table 3 illustrates the causes of mortality. Ten dead patients had presented postoperative complications. Recurrences were observed in 27 patients (14.2%). Twenty-four patients were operated by the same technique and 3 by steroids. Recurrences were mainly observed in mixed lesions hyperdense with a recurrence rate of 2.7% for the hypodense lesions and 25% for hyperdense lesions; the difference was statistically significant ($X^2 = 6.64$, $p \leq 0.005$).

Table 2. Details of Complications Observed in a Total of 29 Patients

Type of Complication	Number (%)
Acute Subdural Hematoma	03 (1.58)
Intraparenchymal Hematoma	02 (1.05)
Controlateral CSH	02 (1.05)
Compressive Pneumocephalus	04 (2.11)
Subarachnoid Hemorrhage	02 (1.05)
Superficial Infection	02 (1.05)
Deep Infection (Meningitis)	01 (0.52)
Seizures	01 (1.05)
Temporary Acute Agitated Delirium	05 (2.64)
Pneumopathy	06 (3.17)
Unbalanced Diabetes	04 (2.11)
Unbalanced Arterial Hypertension	03 (1.58)
Stroke	01 (0.52)

Final results were collected after 6 months. One-hundred and sixty-three patients were cured (86.2%), 15 patients presented disabilities (7.9%) and 11 patients died (5.8%); mortality was observed in the early postoperative period. No other patients died during follow-up.

Table 3. Causes of Mortality in a Total of 11 Patients

Age	Associated Disease	Grade	Cause of Mortality
60	Multiple Myeloma and Diabetes	3	Intraparenchymal Hematoma
60	Valve Replacement and Hypertension	3	Acute Subdural Hematoma
63	Coronary Stenosis Operated	3	Stroke
75	Hepatitis and Thrombophlebitis	3	Multi-organ Failure
78	Hypertension and Diabetes	4	Unbalanced Diabetes
79	Leukemia and Pacemaker	3	Complications of Leukemia
84	Manic-depressive	3	Acute Subdural Hematoma
84	Stroke	3	Meningitis
86	Diabetes	3	Unbalanced Diabetes
92	Diabetes	3	Pneumopathy
93	Prostate Adenoma	3	Compressive Pneumocephalus

Discussion

Multiple modalities of treatment of CSH exist. Standard approaches include craniostomy by either burr hole or twist drill, evacuation of the hematoma with or without irrigation and in most instances drainage. Defenders of drainage argued that this latter will allow brain expansion by progressive evacuation of residual fluid after spontaneous evacuation or irrigation of the cavity; also it seems to diminish early complications (42,44,46-48,50-52). Since the mid of the 80's, all series reporting treatment with drainage used a system of closed-drainage. This attitude was adopted because open drainage has been incriminated in high rates of postoperative infections (53-56). In our series the rates of superficial and deep infections were 1.05% and 0.5%, respectively. The rate of superficial infections ranged from 0.2% to 1.5% in literature (27,33,36,56,57), while the rate of deep infections varied from 0.7% to 5.5% (4,12,35,41,56,58-62). Deep infections can be life-threatening as it was the case in our series. In the present series, rates of infections were consistent with those of literature in spite of using open drainage. We assumed that it was due to the fact that the dress was made under aseptic conditions in the operative room and was not manipulated till the ablation of the drain; but large studies are needed to confirm our explanation. Postoperative seizures are reported to occur in 0.5% to 8% of cases (1,41,61-64). In our study, the rate was 1.05%. Some studies have incriminated drains in occurrence of postoperative seizures (39,50,65,66). According to our conclusions, the rate observed in the present series was related to the very soft nature of the drain. Indeed, other complications can occur with classical drains such as bleeding from capsules or cortex, occlusion, and exceptionally rupture (33,39,67-69). It is noteworthy to mention that we did not observe complications associated with the drain. A review of the literature reported recurrence rates in 0% to 37% of patients (5,6,17,21,35,39,41,43,49,50,57,61,70-75). We observed 14.2% of recurrences; they were mainly observed in mixt and hyperdense lesions. Recurrences seemed to be in relation with the preoperative density of the lesion and consequently with the inflammatory status of the hematoma as observed by some authors (4,5,76-78). Overall results of the present series were in total concordance with those of large series of the literature (6,10,12,15,16,27,35,36,43,59-61,67,79,80).

Conclusion

CSH is one of the most frequent disorders encountered in daily practice of neurosurgery. In spite of this issue, there is a little consensus on its treatments. Several approaches are described with equivalent results. One burr hole craniostomy combined with open drainage is an effective, safe and easy technique. The overall rates of complications and outcome of this procedure are good among other forms of treatments. It is also a cost-effective modality of treatment for CSH; so it can be a very interesting method for treatment of CSH regarding health care expenditure particularly in middle- and low-income countries. However, studies with wider scopes and sample size are needed to confirm our results.

Funding

None.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contribution

Souad Bakhti: Conductor of the prospective study, data collection. Nabila Tighilt: Data collection. Mohamed Djennas: Supervisor of the prospective study, chief of department.

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Comments

The article is about one of the most important and common neurosurgical issues which is practiced everyday by all the neurosurgeons. The aim of all the strategies in surgical management is decompression of the brain and prevention of the recurrence. In one of the last meta-analysis which was published on 2014, it was shown that bur hole versus twist drill, irrigation, number of draining catheter, location of the catheter, postoperative position, postoperative time for drainage have no statistical significant effect to prevent the recurrence, but postoperative drainage generally reduces recurrence rate approximately by 60% (1).

The authors tried to reintroduce the open type drainage for chronic subdural hematoma evacuation, regarding their economic crisis. They used the sterile glove as an open drain with low infectious rate. They emphasized that the low risk of infectious is relating to clean dressing in the operation room, but I think in many cases we should change the dressing because of very much drainage after operation. The morbidity and mortality of this prospective study is acceptable in comparison with the other studies but the recurrence rate (14.2%) is higher than in cases with closed drainage (8.4%) (1). Therefore, I agree with the authors about a multicenter study to confirm their results and assess the risks and benefits of this technique.

Mohamadreza Hajiabadi, Neurosurgeon in Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran

Reference

1-Liu W, Bakker NA, Groen RJ. Chronic subdural hematoma: a systematic review and meta-analysis of surgical procedures. J Neurosurg. 121: 665-73, 2014