ORIGINAL ARTICLE

Management and Outcome of Chronic Subdural Hematoma: A Prospective Study of Shaikh Zayed Hospital, Lahore

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ABSTRACT

Background/Objective: *Chronic subdural hematoma (CSH) is a type of intracranial hemorrhage is commonly seen in old age. It has a poor prognosis when misdiagnosed or a delayed treatment can lead to significant morbidity. We evaluated the effectiveness of available surgical treatments for the management and outcome of CSH.*

Method: *The prospective cases (n = 48) of CSH were included from Department of Neurosurgery, Sheikh Zayed Hospital, Lahore during January 2014- December 2017. Detailed history of patients was taken along with comprehensive examinations with CT scans and MRIs. The CSH patients were treated surgically either with burr-hole evacuation (unilateral/bilateral) with irrigation or burr-hole drainage with drain 48 to 72 hours.*

Results: *The mean age of male patients was 68 years and 56 years in female patients. Most of our patients recovered (81.25%; GOS 5) uneventfully. Patients were mostly treated with burr-hole evacuation with irrigation. The 15% patients had required ICU management with GOS 2-3. Older (> 65 years) male patients were at higher risk of CSH. Trauma was not the only major cause of the CSH as history of trauma was not present in the majority (< 25%) of the patients. We found following significant risk factors, i.e., hypertension (73%), DM (62.5%) and ischemic heart disease (60%) and intake of anticoagulant/antiplatelet drugs (60%). A 4% recurrence was reported in our CSH patients. Stroke as a postoperative complication was reported in two patients (4%) and only one patient (2%) died of aspiration pneumonia.*

Conclusion: *Chronic subdural hematoma can be effectively treated by simple surgical intervention if diagnosed early and mortality can be reduced. We found burr-hole evacuation (unilateral/bilateral) with irrigation an effective treatment against CSH, as most of our patients (> 80%) were recovered with it. The trauma was not the only cause of CSH as history of trauma was not present in the majority of the patients, therefore, some other factors are also involved in the CSH formation in old age.*

Keywords: *Chronic Subdural Hematoma; Bilateral Burr-Hole Evacuation; Trauma; Intracranial Hemorrhage.*

INTRODUCTION

Chronic subdural hematoma (CSH) is frequent type of an intracranial hemorrhage commonly seen in old age along with different comorbidities.[1-3] This study was aimed to diagnose CSH in patients and evaluate effectiveness of the treatments followed. We conducted this study to evaluate the effectiveness of available surgical treatments for the management and outcome of CSH at the Department of Neurosurgery at Sheikh Zayed Hospital Lahore from January 2014 to December 2017. We identified few risk factors of chronic subdural hematoma in elderly patients. Glo-

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bally, the incidence of subdural hematoma is increasing since 1967. The prevalence of CSHs is elevating now and it is anticipated that it will become the most typical neurological condition by the year 2030 in United States.[4-5] Elder patients who are being treated with drainage intervention, 32% of one year mortality rate is anticipated.[6] Chronic subdural hematoma can develop into its acute form which can result in an adverse outcome and survival time.[6-10] The conditions can worsen in these cases and can surpass primary brain tumors and metastasis.[11] Chronic subdural hematoma (CSH) has a poor prognosis in case of misdiagnosis and/or with a delayed treatment which can lead to significant morbidity and mortality. It consists of liquefied blood and its breakdown products enclosed in a neo-membrane. Chronic subdural hematoma is located in the potential space between arachnoid and dura-mater. Although, some types of chronic subdural hematomas involve days to weeks with a history of trauma. However, in the majority of patients there is no definite history of trauma which precedes the discovery of chronic subdural hematoma. When there is no associated trauma, other etiologies should have to be considered for example, coagulopathies, vascular malformations, neoplastic and inflammatory conditions etc.[5] A chronic subdural hematoma may result in brain compression and subsequent neurological deficits. It is one of the common neurological condition and often treated with relatively simple and effective surgical procedures. The prognosis for the patients CSH is usually misleading. It is estimated that about 20% of CSH patients can present a poor neurological outcome that can lead to significant disability. The perioperative rate of death susceptibility in CSH patients is between 1.2 – 11%.[7-8,12-13]

The clinical features of these patients are highly variable, thus an initial misdiagnosis is a common dilemma. The complaints are often nonspecific, therefore a high level of suspicion must be maintained. The usual presenting complaints are altered mentation, unexplained history of focal weakness, seizures and symptoms of raised intracranial pressure like headache, vomiting, etc. The variables that predispose formation of chronic subdural hematoma are being male gender, age more than 70 years, cerebral atrophy, coagulopathies of various causes of chronic liver and renal diseases and use of anticoagulants for various concomitant diseases like ischemic heart disease (IHD). In elderly patients, the trauma and disprin therapy can be risk factors in the development of a chronic subdural hematoma. The CT and MRI scans are the common diagnostic investigations for CSH on which it appears as a pericerebral fluid collection along the convexities with a convex outer border and concave inner border.

MATERIALS AND METHODS

This study was conducted in the Department of Neurosurgery at Sheikh Zayed Hospital, Lahore from January 2014 to December 2017. We included all patients with chronic subdural hematoma with age between 40 – 80 years who gave consent. We excluded pregnant women, children less than 18 years of age, patients with renal failure and those patients who did not give consent. Tumor surgery patients and trauma surgery patients were also excluded from the study. We enrolled 48 older patients who were presented with chronic subdural hematoma (CSH). Informed consents were was taken from all patients or their attendants conformed to institutional ethical standards. Patients' background information and clinical presentations were recorded. The history of any co-existing disease or co-morbidities such as hypertension, diabetes mellitus (DM), ischemic heart disease (IHD), chronic renal and liver diseases were recorded. The information on different drug intake, such as, anticoagulants, antithrombolytic, chemotherapeutic agents, etc., was also noted along with corresponding duration of intake. Further, history regarding trauma was also noted.

Data analysis was performed in SPSS (v.22.0, IBM Corporation) software. A Chi Square (χ^2) test was applied to look a relative significance at $p < 0.050$ in the co-morbidities (hypertension, DM, IHD, chronic kidney and liver diseases, trauma) between the respective occurrences out of total. A Chi Square (χ^2) test was also applied to look a relative significance at $p < 0.050$ in the particular surgical option and outcome related parameters (GOS, recurrence, recovered, mortality, postoperative complication) out of total.

All patients had undergone a CT scan (brain plain). The MRI procedure was also performed in most of the patients, especially in patients with isodense hematoma on CT. The routine lab tests were conducted for CBC, coagulation profile, PT, APTT, renal and liver profiles (LFTs, RFTs) and other relevant tests for the stabilization for surgical intervention. The regular mode of treatment for CSH was the burr-hole evacuation i.e., copious irrigation with warm saline till the effluent was cleared. However, those patients which presented with recurrence or significant brain atrophy, the burr-hole evacuation was followed by drainage with a subdural drain for 48 to 72 hours.

RESULTS

There were 48 patients with chronic subdural hematoma (CSH) enrolled in the Neurosurgery Department of Shaikh Zayed Hospital, Lahore. The mean age of male patients was 68 years and 56 years in female patients (**Table 1**). Out of 48 patients, 32 were male (66.6%) and 16 were females (33.33%).

Table 1: *Background Information of Chronic Subdural Hematoma (CSH) Patients (n = 48).*

	Male Patients	**Female Patients**
Number	32	16
Percentage Prevalence %	66.6	33.3
Mean Age (years)	68	56

Table 2 describes the clinical history in CSH patients. In majority of CSH patients, the trauma was not the cause of the diseases as history of trauma was present in only 11 (22.91%) CSH patients. Only two patients (4.16%) had chronic liver disease with altered LFTs and coagulation factors. However, 29 (60.41%) patients were on anticoagulants/antiplatelets for some other concomitant diseases such as IHD, stroke, etc. The 35 (72.91%) patients had hypertension, 30 (62.5%) had diabetes mellitus and 29 (60.41%) patients had been treated for ischemic heart disease (IHD). History of chronic renal disease was present in only one (2.08%) patient.

Most of our patients (> 80%) did well with burr-hole evacuation (unilateral/bilateral) with irrigation with normal saline under general anesthesia. Only few patients required treatment with burr-hole drainage with drain, whereas, the rest of the patients (> 80%) were treated only with burr-hole evacuation with irrigation. The 39patients (81.25%) recovered uneventfully and were discharged within a week's time with (Glasgow Outcome Scale) GOS 5.Six (12.5%) patients required ICU management and remained admitted for more than two weeks. These patients were discharged with significant neurological deficit with GOS 2 – 3. Two patients (4.16%) were re-admitted because of recurrent chronic subdural hematoma. They were re-explored and burr-hole evacuation with subdural drain placement was done. Moreover, two patients (4.16%) developed complications in the form of stroke during postoperative course. One patient (2.08%) died because of the pulmonary complications (aspiration pneumonia). **Table 3** shows the summary of the management of surgery and outcome of CSH patients. There

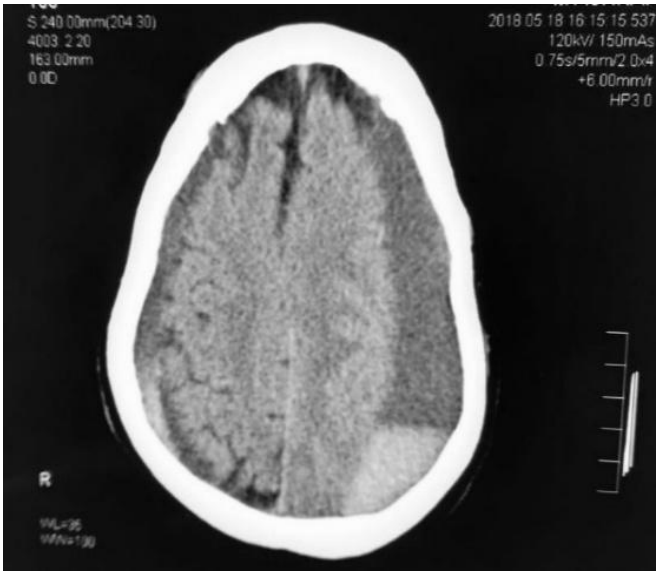

Fig. 1: *Bilateral Subacute on Chronic Subdural Hematoma.*

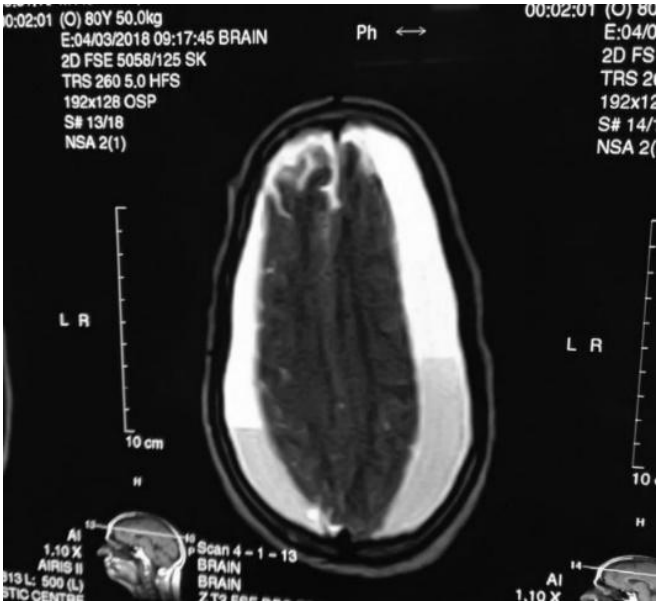

Fig. 2): *MRI of Bilateral Chronic Subdural Hematoma.*

existed a relative significance (significant difference at $p < 0.050$) between all mentioned history parameters, surgery options and outcome (recurrence, recovered, mortality, postoperative complication) out of total except, diabetes mellitus, ischemic heart disease and anticoagulant therapies (**Tables 2, 3**). Some CT and

MRI scans are mentioned in figures. **Figure 1** shows a bilateral subacute on CSH. **Figure 2** represents an MRI of bilateral CSH. **Figure 3** shows a CT scan of recurrent bilateral CSH.

DISCUSSION

The epidemiological study of CSH is still in progress around the world. The choice and option for CSH surgery is still in debate due to complexities of previous ailments in old age, non-specific symptoms and mistreatments.[1,3] The purpose of the current study was to monitor effectiveness of the currently available surgical treatments to find out the resulting risk factors and outcomes of chronic subdural hematoma in elderly patients. Ko et al., (2008)[14] reported following as risk factors of CSH: diabetes, epilepsy, dementia, use of antiplatelet or anticoagulants, chemotherapeutic drugs, bleeding occurrences, leukemia, liver dysfunction, kidney diseases and intracranial hypotension. Most of our patients recovered (81.25%; GOS 5) uneventfully, mostly treated with burr-hole evacuation with

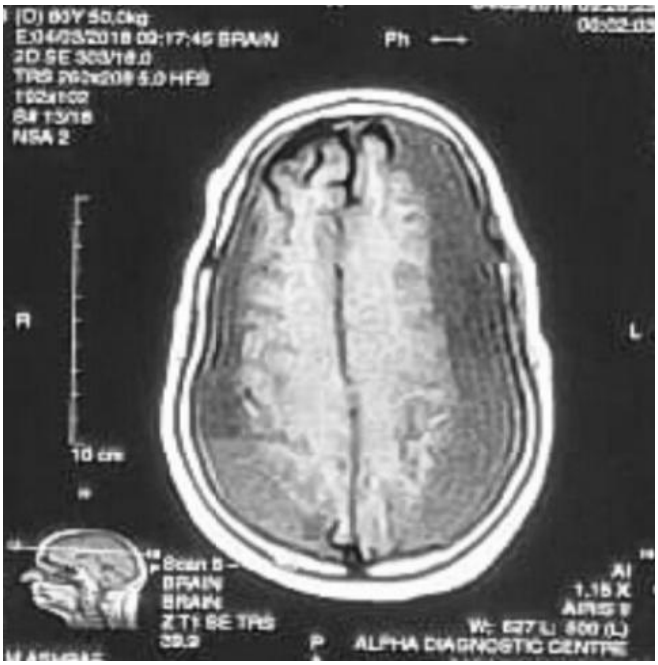

Fig. 3: *CT Scan of Recurrent Bilateral Chronic Subdural Hematoma.*

Table 2: *Clinical History of Co-morbidities and Therapies in Chronic Subdural Hematoma (CSH) Patients.*

Clinical History	Number of Cases	Percentage Prevalence %	p-value	*df	Chi square χ^2
Hypertension	35	72.91	0.001**	1	10.083
Diabetes Mellitus	30	62.50	0.083	1	3.000
Ischemic Heart Disease	29	60.41	0.149	1	2.083
Chronic Renal Disease	2	4.16	0.000**	1	40.333
Chronic Liver Disease	1	2.08	0.000**	1	44.083
Trauma	11	22.91	0.000**	1	14.083
Anticoagulants/Antiplatelets Therapy	29	60.41	0.149	1	2.083

*degrees of freedom
**significant ($p < 0.05$)

Table 3: *Management of Surgery and Outcome.*

Parameters		Number of Cases	Percentage Prevalence %	*p-value*	**df*	*Chi square* χ^2
Type of Surgery	Burr-hole evacuation with irrigation	41	85.41	0.000**	1	24.083
	Burr-hole drainage with drain	7	14.58	0.000**	1	24.083

Glasgow Outcome Scale	GOS: 5	39	81.25	0.000**	1	18.750
	GOS: 2 – 3	6	12.5	0.000**	1	27.000
Recovered Uneventfully		39	81.25	0.000**	1	18.750
CSH Recurrence		2	4.16	0.000**	1	40.333
Postoperative Complication		2	4.16	0.000**	1	40.333
Mortality		1	2.08	0.000**	1	44.083

*degrees of freedom
**significant ($p < 0.05$)

irrigation. The 15% patients had required ICU management with GOS 2 – 3. Older (> 65 years) male patients were more at risk of CSH. Trauma was not the only major cause of CSH, as history of trauma was not present in the majority (< 25%) of the patients. We found following significant risk factors, i.e., hypertension (73%), DM (62.5%) and ischemic heart disease (60%) and intake of anticoagulant/antiplatelet drugs (60%). A 4% recurrence was reported in our CSH patients. Stroke as complication was reported in two patients (4%) during postoperative course. And only one patient (2%) died of aspiration pneumonia. It has been reported that CSH was more present in men (98%) as compared to women (2%).[5] This data is consistent with other studies of different countries.[15-19] In our cases, there were more male patients (65.6%) as compared to female patients. Balser et al., (2015)[5] reported that 73% of CSH patients were with age greater than 65 years in their study. This data is consistent with other studies of different countries.[20-21,18]

Yamamoto et al., (2003)[22] described that seizure history and previous diabetes mellitus are closely associated with the incidence of CSH recurrence. Adhiyaman et al., (2001)[23] indicated that CSH can follow a minor trauma, but a history of direct trauma to the head was absent in around half of the presented cases. They also reported that use of anticoagulant therapies as significant risk factors in the occurrence of CSH.[2] Pneumonia has been reported as the medical complexity in about some of CSH cases.[2,24-26] Stroke as complication was reported in our two patients (4%) during postoperative course. It is well accepted that postoperative complications and recurrences exist in CSH.[27] The medical history, such as hypertension, diabetes mellitus, COPD, dementia and ischemic heart diseases have been reported in patients with chronic subdural hematoma.[28] Bleeding tendency and hematoma density have been considered as major risk factors of CSH recurrences.[14] It is known that anticoagulation and antiplatelet medications can increase the risk of hemorrhages.[5] It is mentioned by Balser et al., (2015)[5] that a subdural hematoma can be prevented spontaneously if it is diagnosed timely and managed properly, however, an untreated or misdiagnosed hematoma can be fatal in the form of impaired neurological condition or cerebral decompensation.[29] Moreover, a recurrence rate would be less than 15% of CSH patients treated with drainage as compared to those who do not.[30] Yang et al., (2012)[31] mentioned that old age susceptibility has been anticipated from an increased cerebral atrophy, because a positive correlation exists between the prevalence of CSH and the quantity of brain atrophy. Such increased atrophy can prompt trauma which promotes a spacing in the layer of dura-arachnoid,[32] because granulation tissue proliferation can be induced by fibrin on inner side of dural surface.[33]

In the current study, 60% of CSH patients were having anticoagulants or aspirin for some other problem which is consistent with other studies. An increased use of anticoagulant drugs in elderly patients with brain atrophy conditions can significantly raise the CSH incidence. The use of antiplatelet or anticoagulant drugs can increase the risk of CSH condition up to 10 folds.[34] The elevated prevalence of CSH in the aged population emphasizes the fact that CSH could likely to emerge from degenerative disease other than trauma. We also found that trauma was not the major cause of CSH, as history of trauma was not present in the majority of the patients. In the past, the pathogenesis of CSH was never been considered a consequence of traumatic condition alone.[35-36] It was first demonstrated in the 18th century by Virchow that: "exudates gather in subdural gaps from inflammatory processes".[35] Later on, in the beginning of the 19th century, Trotter suggested trauma in contrary to the inflammatory

processes.[4] Further studies have explained that the presence of blood in the subdural space, secondary to meningeal trauma prompts some inflammatory processes by dural cells, which can lead to the development of vascular neomembrane and cause recurrent microhemorrhages followed by hematoma growth.[37-38,35] A study by Sousa et al., (2013)[18] has also reported that less than 50% of patients did not present a trauma history.[18] Moreover, a study demonstrated that CSH was reported nine months later, after trauma incidence.[39] It is known that a trauma emerges from the exudation of blood in subdural space and a large subdural space can predispose to blood collection. Bridging veins of subdural region include thin vessel walls with reduced collagen and hence results in more susceptibility than the subarachnoid region.[40]

The surgical evacuation procedures via burr-holes is accepted globally but percentage outcome varies up to 40% [1 Ernestus et al., 1997]. Most of our patients did well with burr-hole evacuation (unilateral/bilateral) with irrigation with normal saline under general anesthesia. Only few patients required treatment with burr-hole drainage with drain. Ernestus et al., (1997)[1] conducted a retrospective study to find out operative options in patients with CSH and suggested that burr-hole craniostomy with closed-system drainage is best choice for CSH treatment.[1] Lee et al., (2004)[41] supported burr-hole drainage with irrigation of hematoma and closed-system drainage. Mori and Maeda (2001)[27] reported a good recovery in 500 consecutive CSH patients who were treated with burr-hole craniostomy with closed system drainage. In their study, around 1% patients died due to disseminated intravascular coagulation. They found recurrence in about 10% of CSH patients. Existence of cerebral infarction and old age were significantly correlated with poor brain re-expansion. They found postoperative complications in around 5% of CSH patients such as acute subdural hematoma from an incomplete hemostasis of wound on the scalp and tension pneumocephalus.[27] During 1943 – 1980, the CSH patients were treated with burr-hole without drainage as mentioned by Robinson (1984) and mortality rate of 1.5% was reported. Moreover, a recent comprehensive systemic review mentioned that a use of closed system drainage after burr-hole evacuation can have a more potential to eliminate recurrences and general complications.[42] We reported a 4% recurrence in our CSH patients. In chronic subdural hematoma, a recurrence is likely to occur and Torihashi et al., (2008)[43] conducted a study to determine independent predictors linked with CSH recurrence in surgical cases. They considered following factors: age, sex, DM, hypertension, cerebrovascular disease, heart disease, anticoagulant & antiplatelet treatments, bilateral CSH and atrial fibrillation. They reported recurrence in 61% patients. They suggested bilateral chronic subdural hematoma as an independent predictor for CSH recurrence. They also concluded that medications like anticoagulants and antiplatelets might provoke the development of CSH as the association was found insignificant.[43] Ko et al., (2008)[14] mentioned that in their institute, the burr-hole drainage with drain has been an effective treatment option from 20 years. Similarly, Oishi et al., (2001)[44] also supported the use of burr-hole surgical option.

A retrospective CSH study during 1980 – 2002 was conducted by Gelabert-González et al., (2005)[2] and included patients treated with burr-hole craniotomy with closed-system drainage. They observed around 17% postoperative complications and 2% mortality rate. Patient age greater than 70 and clinical grade, both are related to poor prognosis.[2] However, Singla et al., (2013)[3] explained that a subdural evacuating port system SEPS is an effective and safer with low invasiveness treatment option to manage CSH. Weigel et al., (2003)[45] conducted research to find out survival rates in patients of 90 years of age with symptomatic CSH. It was mentioned that a postoperative outcome of CSH has not yet improved from last 20 years. It was also mentioned that twist-drill and burr-hole craniostomy are first or primary treatment level, whereas, craniotomy can be considered as second treatment level.[45] The CT is a diagnostic tool in great majority of chronic subdural hematoma. However, in an isodense hematoma with marked cerebral atrophy and prominent subarachnoid spaces may present difficulties to establish diagnosis. Magnetic resonance imaging (MRI) will be unequivocally helpful in confirming the diagnosis. In these patients coagulation abnormalities are frequently associated and their perioperative management is important. In most of symptomatic patients, an evacuation can be carried out under local or general anesthesia with simple burr holes (unilateral or bilateral) followed by serial CT scans in postoperative management. An early diagnosis and evacuation were well rewarding in majority of the patients, as more than 80 percent of our patients improved markedly without any neurological deficit.

CONCLUSION AND RECOMMENDATION

Chronic Subdural hematoma (CSH) can be effectively

treated by relatively simple surgical intervention if diagnosed early and morbidity & mortality can significantly be reduced. We found burr-hole evacuation (unilateral/bilateral) with irrigation as an effective treatment against CSH as most of the patients (>80%) were recovered with it. In majority of CSH patients, the trauma was not the only cause of the diseases as history of trauma was not present in the majority of the patients. Therefore, some other synergistic risk factors may also involve in CSH formation in old age. The significant risk factors were: hypertension (73%), DM (62.5%) and ischemic heart disease (60.41%) and intake of anticoagulant/ antiplatelet drugs (60%). Recurrent CSH was reported 4%, postoperative complications were 4% and mortality was 2%. Further studies are required to affirm other risk factors.

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