ORIGINAL ARTICLE

Surgical Outcome of Chronic Subdural Hematoma by Two Burr Hole Technique

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ABSTRACT:

Objective: *To study postoperative outcome of chronic subdural hematoma by two burrhole technique.*

Study Design: *It was a descriptive cross sectional study.*

Place and Duration of Study: *It was a hospital based study which was conducted in the Department of Neurosurgery HMC, from 10th June 2013 to 10th June, 2015.*

Materials and Methods: *This study was conducted on 193 patients of chronic subdural hematoma. These patients were selected on the basis of history, clinical features and CT scan brain showing presence of chronic subdural hematoma. For data analysis SPSS version 20 software was used.*

Results: *We studied one 193 patients. Among these patients 145 were male and 48 were female with a male to female ratio of 3.1:1. The age range was 20 to 80 years with an average of 65.9 years. One hundred and ten patients (59.0%) gave a history of head injury. Eighty – three patients (43.0%) did not give history of any injury to the head. Twenty-nine patients were operated under local anesthesia while rest of 162 (84%) were operated under general anesthesia. On discharge 163 (84.5%) patients showed favorable outcome and 30 (15.5%) patients showed unfavorable surgical outcome out of them 13 patients died with a mortality rate of 6.7%.*

Conclusion: *Chronic subdural hematoma is an important reversible cause of mortality and disability specially in elder patients. A favorable surgical outcome was observed when patients of chronic subdural hematoma were operated by two burrhole technique and assessed after three days of surgery. Mortality and morbidity of chronic subdural hematoma has decreased markedly in recent years because of improved diagnostic facilities, early surgical intervention, good and minimal invasive surgical procedures.*

Key Words: *Chronic subdural hematoma, CT Scan, Two burr holes craniostomy.*

Abbreviations: *CSDH: Chronic Subdural Hematoma. GCS: Glasgow Outcome Score. Glasgow Coma Scale.*

INTRODUCTION

Chronic subdural hematoma (CSDH) is collection of blood in subdural space of more than 21 – days duration, involving single hemisphere in 75 – 80% cases and 20 – 25% cases of CSDH are bilateral.[1-3] Its containing fluid is dark "motor oil" in appearance which does not clot. Bilateral CSDH usually does not presents with headache, its surgical outcome is good but chances of recurrence are more than unilateral CSDH.[3, 4] Commonly it is a disease of elderly people with an average age of 63 years in whom brain atrophy increases potential subdural space thereby increasing chances of bridging veins to bleed after head trauma but can occur at any age.[5-9] Coagulopathies and anti-platelet/anticoagulant agents increase chances of chronic subdural hematoma.[10-12]

Firstly, chronic subdural hematoma was described in 1658 by J.J. Wepfer followed in 1761 by Morgagni. In 1840, Honore de Balzac described a case of CSDH, its traumatic origin and surgical treatment. In 1857, Virchow denied the traumatic origin of CSDH and gave it the name of pachymeningitis hemorrhagica interna, which he explained by inflammatory processes. Trotter in 1914, recognized the traumatic etio-

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logy of chronic subdural hematoma.[13]

Chronic subdural hematoma is one of the most common clinical entities in daily practice of neurosurgery that can be avoidable and is amongst the commonest neurosurgical conditions needing surgical intervention.[14]

It displays wide diversity of clinical features like dementia, confusion, language difficulties, hemiplegia, seizures, transient ischemic attack symptoms, parkinsonism, psychotic problems and coma.[15] Recognition of these features is the key to early diagnosis and prompt treatment.[15,16]

Various theories have been proposed regarding its etiology and pathogenesis, the most important are osmotic theory and re-bleed from the membrane around the clot.[17,18] Radiologically it is diagnosed either by CT scan or MRI brain.[19]

Postoperative/surgical outcome in terms of Glasgow outcome score, of CSDH is not constant as various national and international studies are available and depends on various factors like age, site of hematoma, size, unilateral or bilateral and surgical technique etc. but good improvement in Glasgow outcome score and GCS level is cited in studies with an average improvement of 44 – 48%. There is clinical improvement when the subdural pressure is reduced to zero which usually occurs after three weeks of hematoma removal.[2] Craniotomy is usually reserved for recurrent chronic subdural hematoma and middle meningeal artery ligation is applied in repeated recurrence of CSDH.[20]

The present study was conducted to study postoperative outcome of chronic subdural hematoma by two burr-holes technique at the department of neurosurgery, Hayatabad Medical Complex, Peshawar.

MATERIALS AND METHODS

Study Design: It was a descriptive cross sectional study.

Setting: A hospital based study that was carried out in The Department of Neurosurgery, Hayatabad Medical Complex, Peshawar.

Duration of Study: It was of 2 years duration that was carried out from 10th June, 2013 to 10th June, 2015.

Sample Technique: A simple consecutive non-probability sampling technique was applied for this study.

Sample Size

This study was conducted on one hundred and ninety – three (193) patients suffering from chronic subdural hematoma. These patients were selected on the basis of history, clinical features and CT scan showing the evidence of chronic subdural hematoma.

Sample Selection

Inclusion Criteria

1. Patients of CSDH confirmed on CT scan brain.
2. Patients of 20 – 80 – years age and both genders.
3. Patients of subdural hematoma with history of more than 21-days duration.
4. All patients with initial GCS level of 4 to 15 on presentation.

Exclusion Criteria

1. All Patients having subdural empyema.
2. Patients having bilateral hemispheres chronic subdural hematomas.
3. Patients having subdural hygroma.
4. Chronic subdural hematoma with under lying brain contusion.
5. Multiple brain hematomas patients.
6. Post VP Shunted patients.

Data Collection Procedure

After permission from hospital ethical committee, patients with CSDH admitted in Neurosurgery Department of Hayatabad Medical Complex, selected randomly through Out Patient Department (OPD), Emergency and Calls from other units of Hayatabad Medical Complex Peshawar were operated. Only those patients who fulfilled inclusion criteria were included in the study. Informed consent was taken from all patients or attendants of patients. For the collection of information and observations, a predesigned performa was used. This performa included the information about the identity of the patient like name, age, gender, address, admission No, mode of head trauma (if any), Glasgow Coma Scale level at the time of presentation and postoperative GOS.

Diagnosis of CSDH was made on the basis of history, clinical features, CT brain and per operative findings. Only patients of unilateral chronic subdural hematoma were operated. All the patients were operated through two burrhole technique by a Neurosurgeon (fellow of the College of Physicians and Surgeons of

Pakistan (CPSP) with a minimum five years post fellowship experience) either under general anesthesia or local anesthesia (if not fit for General Anesthesia). Patients were properly positioned on the operating table in supine position with the head tilted to one side and flat or downward. Local anesthesia at incision sites was given to all patients, for to decrease per-operative bleeding and pain after surgery for some time after recovery. After cleansing and draping, the skin incisions were made at proper sites. Two burr holes were made. Frontal burr hole was placed 3.5 cm from the midline on the coronal suture. Other burr hole was made in the temporal or parietal region depending upon the location and size of chronic subdural hematoma. After burr holes, dura was cauterized and then incised at both sides of burr holes. Dark colored fluid started coming out under pressure. It was washed thoroughly with normal saline until clear fluid started coming out. Head side of the table was also tilted down so that the entire clot could be evacuated thoroughly by irrigation. At the end, spongestone was applied at site of burr holes. In all cases, the subdural cavity was filled with normal saline so that no air should remain inside to prevent postoperative pneumocephalus. Hemostasis was secured and incision wounds were closed in layers in reverse order.

According to our unit policy, all the patients were given third generation cephalosporins during and after surgery for five days. All the patients were shifted to the Neurosurgery ward or Head Injury Unit after surgery. Only seven patients shifted to surgical ICU of Hayatabad Medical Complex postoperatively as their conditions were not suitable to shift them to ward directly. Their heads were kept twenty to thirty degree down. They were kept well hydrated. All the patients were assessed for improvement in neurological status immediately postoperatively on same day as well as throughout their stay in hospital. If the neurological status was deteriorated, a repeat CT scan was done for recollection or other postoperative intracranial complication. The patients were discharged by third to fifth postoperative day.

Patients were followed post operatively for three days and were assessed by a Neurosurgeon (fellow of the College of Physicians and Surgeons of Pakistan (CPSP) with a minimum five years post fellowship experience) for any morbidity and were categorized either as with favorable outcome or unfavorable outcome according to the GOS as given in Table A. Observation and examination were done by trainee medical officer and data was recorded in a predesigned Performa. To control confounders and bias in the study results, exclusion criteria was followed strictly.

Patients with postoperative Glasgow outcome score of 5 or 4 were categorized as favorable outcome and those with Glasgow outcome score 3 or less were categorized as unfavorable outcome.

Data Analysis Plan

The data was analyzed using the statistical program SPSS version 20. Descriptive statistics like mean ± standard deviation were calculated for quantitative variables like age and duration of illness. Frequency/ percentage were calculated for categorical variables like gender. Surgical outcome (favorable/unfavorable), using GOS; was stratified among the age and gender and the initial GCS level to see the effect modifiers. All results are presented in the form of tables and graphs/charts.

RESULTS

We studied one hundred and ninety – three (193) patients of unilateral chronic subdural hematoma. Among these, there were 145 male patients (75.1%) and 48 were female patients (24.9%), (Figure A). The male to female ratio was 3.1:1. The age range was 20 to 80 years with an average age of 65.9 years ± 10.08 SD. (Table 1 and Table 2).

Table 1: *Age – Group Distribution.*

Age Groups (In Years)	Frequency	Percent (%)
20 – 35	4	2.1
35.1 – 50	11	5.7
50.1 – 65	68	35.2
65.1 – 80	110	57.0

Table 2: *Glasgow Coma Score on Presentation.*

Initial GCS	Frequency	Percent (%)
3 – 5	11	5.7
6 – 8	32	16.6
9 – 12	57	29.5
13 – 15	93	48.2

Duration of illness was from three weeks to eight weeks with mean of 5.5 ± 1.4 SD, (Table 3).

Table 3: *Outcome Groups.*

Outcome	Frequency	Percent (%)
Favourable	163	84.5
Unfavourable	30	15.5

One Hundred and ten (57.0%) patients gave a history of head trauma three to eight weeks before their presentation (Table 4). Mode of trauma was, sixty – six patients (34.2%) had a fall, forty – two patients (21.8%) had a history of road traffic accident and eight patients (4.1%) had history of assault to head. Eighty – three patients (43.0%) did not give any injury to the head when asked after treatment (Table 4).

Table 4: *Age – Group Versus Outcome.*

Age – Group	Outcome		Total	Chi Square Significance
	Favorable	Unfavorable		
20 – 35	4	0	4	
35.1 – 50	10	1	11	
50.1 – 65	66	2	68	0.001
65.1 – 80	83	27	110	

Twenty – three patients had deranged bleeding profile, out of them three were diagnosed cases of thalassemia minor, nine were cirrhotic, four were patients of chronic renal failure, two were on anticoagulant therapy and five were not having any such problem or not using any medications that could have altered their coagulation profile. One hundred and forty – four patients were hypertensive, seventy – eight patients had diabetes mellitus and seventeen patients had both diabetes mellitus and hypertension.

On presentation, ninety – three patients (48.2%) had a Glasgow coma scale level 13 – 15. Fifty-seven patients (29.5%) had GCS level 9 – 12. Thirty – two patients (16.6%) presented with 6 – 8 GCS and eleven patients (5.7%) had GCS 3 – 5 (Table 5).

CT scan brain of one hundred and forty – eight patients (76.7%) showed hypodense hematomas and hematomas on CT scan of forty – five patients (23.3%) was of mixed density.

Table 5: *Initial GCS vs. Surgical Outcome Stratification.*

Initial GCS	Outcome		Total	p-value
	Favorable	Unfavorable		
3 – 5	0	11	11	
6 – 8	20	12	32	
9 – 12	52	5	57	
13 – 15	91	2	93	< 0.0001

One hundred and seventy – three patients were operated in emergency on presentation and eighteen were operated as elective cases. In all the patients, two burr holes were made strategically over the most prominent collection of the hematoma. Twenty – nine patients were operated under local anesthesia while the rest were operated under general anesthesia.

Postoperative CT scan was done in all cases on 3rd postoperative day and any time in those patients who deteriorated neurologically.

Complications

Three patients (1.6%) developed local wound infection. Nine patients (4.7%) developed pneumocephalus and three out of them deteriorated but two improved after inhalation of 100% oxygen and one died. Post operatively, thirteen patients (6.7%) had episodes of seizure and started on antiepileptic drugs. Two died of uncontrolled seizures. Ten patients (5.2%) were operated twice for recollection through same burr holes. Three patients (1.5%) had craniotomy for repeated recollection. Six patients (3.1%) developed brain contusion and two patients (1.03%) had intracerebral bleed (ICB) with intraventricular extension. Among those two patients who developed ICB, one female patient was hypertensive and had history of myocardial infarction in past. Her neurological condition deteriorated and she died on 2nd postoperative day. Two patients (1.03%) developed diabetes insipidus. Three patients (1.6%) developed subdural empyema and 1 patient (0.5%) developed epidural hematoma. One patient (0.5%) developed brain herniation and died. Eight patients died without any known cause but their preoperative GCS was below 8.

Outcome

On discharge, 163 (84.5%) patients showed favorable

surgical outcome (Grade IV and V on Glasgow outcome score). Thirty patients (15.5%) showed unfavorable postoperative outcome (Grade I, II and III on Glasgow outcome score) and out of them 13 (6.7%) patients died (Grade I on Glasgow outcome score), (Table 6).

Gender – Outcome, Age – Outcome and Initial GCS – Outcome stratification is given in tables 7, 8 and 9 respectively.

We concluded from our study that two burr holes craniostomy/technique for evacuating chronic subdural hematoma is safe, effective and quick method with minimal complications and mortality.

DISCUSSION

Chronic subdural hematoma (CSDH) is collection of blood in subdural space, involving single hemisphere in 75 – 80% cases and 20 – 25% cases of CSDH are bilateral. Commonly it is a disease of elderly people[21] with an average age of 63 years in whom brain atrophy increases potential subdural space thereby increasing chances of bridging veins to bleed after head trauma due to frequent falls, but can occur at any age.[6,8] Coagulopathies and Antiplatelet/anticoagulant agents increase chances of chronic subdural hematoma. Lindvall P et al,[22] in a prospective cohort study has concluded that the risks of anticoagulant use are over-represented and there is no increased risk for recurrence or mortality in patients who use anticoagulants preoperatively.[22]

Although chronic subdural hematoma is not common in young people, especially spontaneous CSDH is very unusual in young age. Wang HS et al,[6] presented a case of spontaneous chronic subdural hematoma in an adolescent girl. The patient presented with severe headache and blurring of vision without any history of trivial head injury. CT scan and MRI brain done that a unilateral chronic subdural hematoma. Burr hole aspiration done successfully but cause and risk factors of hematoma were not established.[6]

Gilbert – Gonzalez M et al,[8] conducted a study to analyse demographic, clinical and radiological findings and surgical results in a series of 42 patient of young age (4 to 39 years age) with chronic subdural hematoma. They concluded that chronic subdural hematoma is rare pathology in first decade of life. It mainly affects males and head ache is usually the first symptom. Prognosis is good in young patients, since postoperative complications and recurrence are less frequent in young age than older populations.[8] In our study, four patients were in young age between 20 to 35 years with an average age of 29.5 ± 2.1 years.

Souse EB et al,[23] retrospectively analyzed a series of 778 patients with chronic subdural hematoma for epidemiological characteristics. A conclusion was presented by them after this study that CSDH is more common in elderly men. Treatment with burr holes and drainage is simple and safe method for treatment.[23]

In our study the youngest patient of chronic subdural hematoma was twenty – three years of age while the oldest patient was eighty years old. Four patients (2.1%) were less than 36 years of age (mean age 29.5 years) while more than 60 years of age were eighty – nine patients (49.5%). A male preponderance among the cases was seen in a ratio of 5:1. In our study male to female ratio is 3.1:1, that 145 patients (75.2%) were male and 48 patients (24.8%) were female.[24]

Falls and antithrombotic therapy are the frequent risk factors for chronic subdural hematoma.[10,11,25] In our study, one hundred and fourteen patient (59.1%) gave history of head trauma in the past while seventy – nine patients (40.9%) did not give any history of head injury. In head trauma patients, fall patients were sixty six (34.2%), road traffic accident patients were forty (21.8%) and head assault patients were 8 (4.1%). Twenty – three patients (11.9%) had deranged bleeding profile, out of them three (1.5%) were diagnosed cases of thalassemia minor, nine (4.6%) were cirrhotic, four (2.1%) were patients of chronic renal failure, two (1.03%) were on anticoagulant therapy and five (2.5%) were not having any such problem or not using any medications that could have altered their coagulation profile.

There is no uniform agreement on the best method to treat chronic subdural hematoma and this is still a matter of debate. However, over the past 160 – years, a dramatic improvement in postoperative outcome of CSDH has achieved following better understanding of the pathophysiology, the introduction of modern imaging techniques and refinement of operative techniques.[26] Two burr holes craniostomy seems to be the most commonly performed procedure for decompressing of chronic subdural hematoma within the past 30 years.[27,28] The widespread use of the burr holes technique is supported and justified by its safety. Morbidity and mortality rates of burr holes craniostomy are comparable with those of twist drill craniostomy while the recurrence rates are similar to those achieved with craniotomy. The drawback of the craniotomy is that there is high mortality and morbidity.[29,30]

Belkhair S and Pickett G[28] conducted a retrospective cohort study on 631 patients to evacuate 713 chronic subdural hematoma, in whom 549 patients were having unilateral chronic subdural hematoma and 82 patients were with bilateral CSDH. In 358 single burrhole and in 355 double burr holes were performed. Meta – analysis showed that there was no significant difference in the revision rates between double burrhole craniostomy and single burr holes craniostomy. Thus burrhole evacuation of chronic subdural hematoma is safe, effective, quick and having lesser complications.[28]

In our study, on presentation, ninety – three patients (48.2%) had a Glasgow coma scale level 13 – 15. Fifty – seven patients (29.5%) had GCS level 9 – 12. Thirty – two patients (16.6%) presented with 6 – 8 GCS and eleven patients (5.7%) had GCS 3 – 5.

The most important factors; in our study, that influenced the surgical outcome were preoperative low GCS level on presentation, old age, hypertension, coagulopathies, cardiac problems, diabetes mellitus, chest infection and postoperative seizures and pneumocephalus. Thirty patients (15.5%) had unfavorable outcome out of them there were thirteen deaths (6.7%) and one hundred and sixty – three patients (84.5%) had favorable and good outcome. This shows that our results are quite satisfactory and comparable to results of most other studies conducted in developed countries.

CONCLUSION

After studying one hundred and ninety – three patients of chronic subdural hematoma, it was found that most of them were old age and had history of head trauma and fall. Males were more than females. It was also found that most of them had favorable and excellent outcome. Conscious level as well as other clinical and neurological status of patients improved significantly. Thus two burrhole evacuation of chronic subdural hematoma is safe, quick and effective surgical method, especially in patients with co-morbidities and in those patients in whom general anesthesia is contraindicated.

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