## ORIGINAL ARTICLE

# Clinical Profile, Complication and Recurrence in Chronic Subdural Haematoma Patients at a Tertiary Care Hospital

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## ABSTRACT

**Introduction:** Chronic subdural hematoma (CSDH) is common neurosurgical condition. A prospective study was conducted to analyse clinical profile, complications and factors associated with recurrence post-surgery.

**Methods:** This prospective study was conducted at Department of Neurosurgery, St. Stephen`s Hospital, Delhi between April 2014 to March 2016. Patients of all age groups and either sex admitted under or referred to Neurosurgery, who had clinical and radiological documentation of Chronic Subdural Hematoma and required burr hole surgery were included in our study.

**Results:** There were 28 males (87.50%) and 4 females (12.50%) in our study. Out of 32, 24 patients had GCS between 14 to 15. Three had GCS between 9 to 13 (9.38%) and 5 had GCS between 3-8 (15.63%). Out of 32, 28 patients presented with clinically bilaterally equal size of pupil and 4 patients had anisocoria. On admission 23 patients were MGS grade 1, 7 patients were grade 2 and 2 patients were grade 3.

**Conclusion:** Chronic Subdural Heamatoma is more common in elderly and has equal gender distribution. Hemiparesis is most common presentation. Trauma is most common etiology while Diabetes mellitus is most common comorbidity of chronic SDH. Brain remaining at depth after surgery and postoperative pneumocephalus lead to higher chances of recurrence.

**Key words:** CSDH, Subdural, Haematoma, Neurosurgery

## INTRODUCTION

Chronic subdural hematoma (CSDH) is common neurosurgical condition.[1] It affects mainly the aged and the incidence reaches up to 58.1 per 100000 populations who are 65 years and above or above.[2] As the population becomes progressively older, its overall incidence is expected to rise. It occurs bilaterally in 19.3%, is more common on the left side and affects the male gender more in a ratio of 2:1.[3]

Subdural hematomas lie between the dura mater and arachnoid membrane. Chronic SDH results from bleeding from the parasagittal bridging veins caused by trauma of slight or moderate intensity.[4] It leads to accumulation of blood between the dura and the arachnoid mater. It eventually forms an encapsulated hemorrhagic fluid collection that enlarges over next several days or weeks, leading to progressive cognitive impairment and neurological decline. The CSDH becomes covered by a thin membrane on its inner aspect and a thicker outer membrane that contains macro capillaries with increased permeability and widened endothelial gap junctions that permit the leakage of blood and enlargement of the hematoma.[5]

Subdural hematoma is classified as chronic type after 3 weeks of trauma and if there is no history of trauma then it is classified according to the duration of symptoms[2] or according to the density of the hematoma based on CT or MRI morphology.[6]

Symptoms and signs of chronic SDH include headache, mental changes, hemiparesis, papilledema and depressed consciousness.[6,7] Symptoms and signs of raised intracranial pressure are more common in younger group.[7] It is difficult to make the diagnosis of chronic based on clinical findings alone because they are nonspecific. Common symptoms and signs in young children with SDH include convulsions, vomiting, lethargy, hyperactive reflexes, enlarged head, full or tense fontanel, sunset eyes and sutural separation.[8]

Recurrence with twist drill craniostomy is much higher than that of burr hole craniostomy (33% vs. 12.1%) or craniotomy (33% vs. 10.8%).[9] Considering the simplicity of procedure, good efficacy and small peri-operative risk burr hole craniostomy has become the procedure of choice.

Chronic Subdural Hematoma is a common neurosurgical entity and burr holesurgery remains the most widely performed procedure worldwide. However, it is not devoid of complications. So we performed a prospective study to analyse clinical profile, complications and factors associated with recurrence post-surgery.

## METHODS

This prospective study was conducted at Department of Neurosurgery, St. Stephen`s Hospital, Delhi between April 2014 to March 2016. Patients of all age groups and either sex admitted under or referred to Neurosurgery, who had clinical and radiological documentation of Chronic Subdural Hematoma and required burr hole surgery were included in our study.

The sample size was calculated by the formula: n=2PQ/L2, where n is sample size, Z is standard normal deviate, 1.96 at 95% confidence level, P is good outcome, Q is bad outcome and L is allowable error. Considering values from previous studies, P=0.75, Q=0.25, taking allowable error as 15% sample size came out to be 32.[10]

Data was collected by history of patient and clinical examination. Radiological data was obtained from the CT Head/MRI brain of patient. Permission from ethics committee of hospital was taken. CT-proven chronic subdural hematoma requiring burr-hole drainage were included in the study. A formal informed consent was obtained. A detailed history was obtained from the patients or their attendants and thorough clinical examination was done. Baseline characteristics that were used for outcome included: age, sex, past medical history (dementia, stroke, ischemic heart disease, arrhythmia, diabetes mellitus, hypertension, pulmonary problems etc), drug history (antiplatelet, anticoagulants), pre-operative neurological parameters (Glasgow Coma Scale, Markwelder grading system (MGS score), presence of neurological deficits etc) and radiological features (site, size, midline shift) of the hematoma.

General anesthesia or local anesthesia with sedation was used based on clinical condition. Standard burr-holes were made over the maximum width of the hematoma. The dura mater and underlying subdural membrane were opened with a cruciate incision and the resulting cusps were coagulated with bipolar diathermy. The subdural collection was washed out with saline using a 20 ml syringe and number 6 infant feeding tube. Operative findings brain expansions following surgery were recorded in detail. Haemostasis was ensured after the procedure, the skin was closed in layers. Most patients were discharged from hospital within three to seven days. Patients were followed for a minimum period of three months both clinically and with a CT scan at 1 week and 3 months after evacuation. Patients were attended apart from scheduled visit in case of emergency and note was made for that. During the follow-up complete neurological evaluation was done and findings were recorded appropriately. Appropriate investigations included hematological tests, coagulation profile tests and imaging was done as indicated.

Recurrent chronic subdural hematoma was defined as clinically symptomatic re-appearance of ipsilateral chronic subdural hematoma, confirmed by CT scan of brain and within 3 months of initial surgery was managed by repeat drainage (simple tapping).

The **Markwalder grading scale**[11] used as a prognostic score in chronic subdural hematoma was:

Grade 0: Neurologically normal
Grade 1: Alert and orientated: absence of mild symptoms such as headache, or mild neurological deficit such as reflex asymmetry
Grade 2: Drowsy or disorientated, or variable neurological deficit such as hemiparesis
Grade 3: Stupor, but responding appropriately to noxious stimuli, several focal signs such as hemiplegia
Grade 4: Comatose with absent motor responses to painful stimuli, decerebrate or decorticate posturing.

Data obtained was charted in Microsoft Excel worksheet. Descriptive statistics was analyzed with SPSS version 17.0 software. Continuous variables are presented as mean ± SD. Categorical variables are expressed as frequencies and percentages. The Pearson's chi-square test was used to determine the relationship between two categorical variables. $P<0.05$ was considered statistically significant.

## RESULTS

Table 1 show that chronic subdural hematomas are more common in the elderly. The youngest patient was 16 year old while the oldest was 81 years of age. There were 28 males (87.50%) and 4 females (12.50%) in our study.

Table no. 2 shows that there were hemiparesis was most common presentation being present in 30 patients (93.8%) followed by Headache seen in 27 (84.4%), vomiting was seen in 3 (9.4%), altered sensorium in 8 (25%) patients and 2 (6.3%) had dementia on clinical examination.

**Table: 1 Demographic profile of patients**

| Variables | Patients (n=32) (%) |
|---|---|
| **Age groups (years)** | |
| 10-19 | 1 (3) |
| 20-29 | 4 (12.5) |
| 30-39 | 2 (6) |
| 40-49 | 1 (3) |
| 50-59 | 4 (12.5) |
| 60-69 | 9 (28.1) |
| 70-79 | 7 (21.9) |
| 80-89 | 4 (12.5) |
| **Gender** | |
| Male | 28 (87.5) |
| Female | 4 (12.5) |

**Table 2: Clinical features at presentation**

| Clinical Features | Patients (n=32) (%) |
|---|---|
| Hemiparesis | 30 (93.8) |
| Headache | 27 (84.4) |
| Altered sensorium | 8 (25) |
| Vomiting | 3 (9.4) |
| Dementia | 2 (6.3) |

**Table 3: Etiology and comorbidity in patients with chronic subdural heamatoma (n=32)**

| Etiology and comorbidity | Patients (%) |
|---|---|
| Trauma | 20 (62.7) |
| Diabetes mellitus | 17 (53.13) |
| Anticoagulant/ Antiplatlet therapy | 10 (31.3) |
| PTCA | 4 (12.5) |
| Hypertension | 5 (15.6) |
| Chronic kidney disease | 3 (9) |
| Pulmonary complication | 2 (6) |
| Alcoholic | 2 (6) |
| Cerebrovascular accident | 3 (9) |
| Coagulopathy | 1 (3) |

**Table 4: Clinical findings on admission (n=32)**

| Clinical parameter | Patients(%) |
|---|---|
| **Glasgow Coma Score (GCS) on admission** | |
| 14-15 | 24 (75) |
| 9-13 | 3 (9.38) |
| 3-8 | 5 (15.63) |
| **Pupil size** | |
| B/L Equal | 28 (87.5) |
| Anisocoria | 4 (12.5) |
| **Markwalder grading scale (MGS) grade** | |
| Grade 0: normal | 0 (0) |
| Grade 1: Alert & orientated, mild symptoms | 23 (72) |
| Grade 2: Drowsy or disorientated, hemiparesis | 7 (22) |
| Grade 3: Stupors, hemiplegia | 2 (6) |
| Grade 4: Comatose | 0 (0) |

Above table no. 3 shows that trauma was the most common etiological factor in our patients. Out of the comorbidities Diabetes mellitus diabetes mellitus was most common, comprising of 17 cases (56.66%).

Table no. 4 shows that there were 24 patients out of 32 had GCS between 14-15. Three had GCS between 9-13 (9.38%) and 5 had GCS between 3-8 (15.63%). Out of 32, 28 patients presented with clinically bilaterally equal size of pupil and 4 patients had anisocoria. On admission 23 patients were MGS grade 1, 7 patients were grade 2 and 2 patients were grade 3.

Table no. 5 shows that there was hematoma was seen in 50% cases on the left side, right sided was in 28.12% and B/L was in 21.87% cases. Left side involvement was more common than right. There were 22 patients had chronic subdural hematoma with ≤ 1 cm width of hematoma and 10 patients had width >1 cm. Out of 32, 28 patients out of 32 (87.5%) had presented with MLS ≥ 5mm and 4 (12.5%) presented with MLS < 5mm.

Table 6 shows that out of 32 patients, 5 (83.3%) out of 6 patients had recurrence in whom brain remained at depth after evacuation of hematoma. One (3.8%) patient had recurrence in whom brain expanded to surface. P value being <0.001 indicating non expansion of brain having higher chances of development of recurrence. There were no significant correlation ship between hematoma width and recurrence. 6 patients had developed pneumocephalus. Of them 4 (66.66%) had recurrence.

Table 7 shows that there were 6 patients had developed peneumocephalus following evacuation of hematoma. One patients developed Atrial Fibrillation and one patients developed ARDS, and both expired.

## DISCUSSION

Chronic subdural hematoma (CSDH) is common neurosurgical condition.[1] Chronic SDH is not a benign disease, its recurrence rate ranges from 0.36%-33.3%.[12] Despite the significant advances in the treatment of CSDH, many patients with CSDH experience relatively high rates of recurrence and morbidity. Previous studies have shown that the burr hole evacuation is effective in improving neurological outcomes in patients with CSDH.

Headache and progressively increasing hemiparesis are common clinical symptoms of chronic subdural hematoma. This disease is an important reversible cause of dementia and disability in the elderly.[13] The most common clinical presentation of patients in this study was hemiparesis, 30 (93.8%) out of 32 patients had hemiparesis. Other common clinical features included headache in 27 patient (84.4%), altered sensorium in 2 (6.3%), vomiting in 3 (9.4%) and dementia in 2 (6.3%). The clinical features of CSDH were similar across most studies but the percentage of patients with specific clinical features different.

**Table 5: Characteristics of heamatoma**

| Varibles | Patients (n=32) (%) |
|---|---|
| **Site of lesion** | |
| Right | 9 (28.12) |
| Left | 16 (50) |
| Bilatral | 7 (21.87) |
| **Heamatoma width** | |
| ≤ 1cm | 22 (68.75) |
| >1cm | 10 (31.25) |
| **Midline shift** | |
| ≥5mm | 28 (87.5) |
| <5mm | 4 (12.5) |

**Table 6: Brain position after surgery and recurrence**

| Brain | No recurrence (n=26) (%) | Recurrence (n=6) (%) | P Value |
|---|---|---|---|
| **Position** | | | |
| At Depth | 1 (16.7%) | 5 (83.3%) | <0.001 |
| At Surface | 25 (88.9%) | 1 (3.8%) | |
| **Hematoma** | | | |
| > 1 cm | 6 (60.0%) | 4 (40.0%) | 0.043 |
| <1 cm | 20 (90.9%) | 2 (9.1%) | |
| **Pneumocephalus** | | | |
| Present | 2 (7.6%) | 4 (66.66%) | 0.0034 |
| Absent | 24 (92.30%) | 2 (33.33%) | |

**Table 7: Complications after surgery**

| Complications | No of patient |
|---|---|
| Pneumocephalus | 6 |
| Atrial fibrillation | 1 |
| ARDS | 1 |

In a series of 100 patients Stroobandt et al.[14] recorded headache in 55% and hemiparesis in 42%, other less frequent symptoms of CSDH were speech disturbances and altered sensorium.

The incidences of hemiparesis and headache reported by Gazzeri et al.[15] in a series of 224 patients were 64.7% and 38.8% respectively.[16] Cameron[17] , in his series, had limb weakness in 40%, cognitive disturbance in 30% and headache 20%. Of the patients of Kaste et al.[18] , 72% presented with headache, and 48% had limb weakness, whereas in Dronfield series[19] , cognitive disturbance was seen in 100%. Mckissock and Loud[20] had limb weakness as the most common presenting symptom.

CSDH usually develops after the tearing of a bridging vein due to direct or indirect trauma to the brain. The etiology of CSDH has not yet been completely elucidated. Traumatic subdural effusion is widely accepted as preliminary stage in the development of CSDH.[21] In the present study 62.7% (20/32)of the patients presented with a history of trauma which correlates with the study done by Gelabert-Gonzalez et al (2005)[22] in which 61.7% patients presented with a history of trauma prior to development of CSDH.

In our study almost one third of our patients (31.3%) were taking aspirin or warfarin. Similar results have been reported by Bonis et al.[23] and Mori et al (2001)[6]. However Gonugunta V (2001)[24] in their retrospective study to demonstrate the effect of warfarin on CSDH had concluded that no adverse events occurred when the warfarin was stopped temporarily for treatment of the CSDH.

Comorbidity such as diabetes mellitus, hypertension, chronic kidney disease, alcoholism and cerebrovascular accident have been studied by various authors as factors affecting the outcome. Kim et al. (2008)[25] reported that 13% of the his patients with CSDH had diabetes mellitus.

Several studies revealed that excessive alcohol consumption leads to brain atrophy. A history of alcoholism has been identified in up to half of CSDH cases. In our study alcoholism was present in 6% (2/32) cases. Ye deok (2013)[26] concluded that alcoholism caused higher prevalence of CSDH.

Ko BS et al. (2008)[27] conducted a study analyzing clinical risk factors related to the occurrence of CSDH and 13.7% of these patients had a preexisting old cerebral infarction. Their study concluded that cerebrovascular disease was not a risk factor for recurrence.

The use of MGS has been a valuable contribution to this problem, in the same way that grading has been for head injury and spontaneous subarachnoid hemorrhage.[28] This well-recognized scale has been adopted by many authors because of its simplicity and becomes more useful when combined with other variables.

Persistence of an enlarged subdural space or poor re-expansion of the brain, in patients undergoing evacuation of CSDH creates the potential for reaccumalation of the hematoma. Therefore, re-expansion of brain after hematoma evacuation is an important factor for good outcome. Fibrous organization of the subdural neomembrane, impairment of cerebral blood flow, and increased brain surface elastance are possible explanation for poor brain re-expansion after surgery. Recurrence of CSDH after first burr hole craniostomy is not rare, and the reported incidence is 7% to 18%.[29] Mori et al (2001)[6] reported recurrence rate 9.8%. In our study the recurrence rate was 18.25% (6/32).

Five (83.3%) out of 6 patients who developed recurrence had brain remaining at depth after evacuation of hematoma. In our study one (3.8%) patient out of 26 developed recurrence in whom brain had come to the surface at the end of surgery. This study found a significant statistical association between recurrence and failure of the brain to expand to the surface after drainage of hematoma ((p <0.001). Mori et al. (2001)[6]in his study reported that recurrenceis de-

pendent on age, size of hematoma and other factors. He too reported that patients who had poor re-expansions of the brain had a higher chances of re-currence.

HL Kang et al (2006)[30] conducted a study on clinical analysis of recurrent subdural hematoma on 213 patients. However in his study re-expansion rate of brain was not associated with recurrence.

The thickness of the hematoma was measured on CT scan and the maximal thickness of the hematoma was noted. Patients presenting with hematoma size >1cm had higher chances of postoperative residual subdural cavity which is a risk factor for reaccumulation of the hematoma as postoperative residual air may prevents reduction of cavity.

In the present study a total of 10 patients had a hematoma thickness >1cm, out of these 4 had a recurrence. There were 22 patients whose hematoma size was <1cm and only 2 developed a recurrence. The P value was measured to be 0.04 thereby concluding that the size of the hematoma is a statistically significant risk factor for the development of recurrence.

Jin Oh et al (2010)[31] conducted a study on CSDH postoperative course and recurrence. He examined the medical records and pre- and postoperative CT scans of 149 consecutive patients who underwent surgery and noted that CSDH recurred in 12% patients. He reported that recurrence was significantly more common in hematomas with more thickness.

Presence of pneumocephalus may be taken as a marker for predicting recurrence. If there is postoperative residual air after surgery it prevents re-expansion of brain and had higher chances for development of recurrence leading to poor outcome.

Zakaraia *et al*[32] reported a 40% incidence of pneumocephalus in a series of 40 patients treated with the burr hole craniostomy with irrigation and drainage. A lower incidence of pneumocephalus had been reported by Miele et al.[33] who operated 44 patients for CSDH using twist drill craniostomy with closed system drainage and found pneumocephalus in 6 patients (14%) where as in our study the incidence of pneumocephalus was 18.75%.

In our study there were 6 patients who developed pneumocephalus postoperatively and four (66.70%) of this patients had recurrence. There were 26 patients who had no pneumocephalus postoperatively. Out of these only 2 (7.6%) developed recurrence. Hence pneumocephalus postoperatively seems to influence recurrence. In this study when recurrence and pneumocephalus were correlated the p value was 0.0034 which is significant.

Stanisic *et al.*[34] studied 99 patients with CSDH and found that a large amount of residual subdural air within four days post-surgery was strongly associated with a high postoperative recurrence rate (24.2%). Which correlates with our study.

Ihab et al (2012)[35] found that immediate postoperative CT scans showed pneumocephalus in 44% patients. Amongst them good postoperative results were found in 73% patients, while bad results were found in 27% patients. With regards to the cases without pneumocephalus, good postoperative good results were found in 86% and bad result in 14% patients. P value in their study was 0.302 and they concluded that no statistically significant difference exist in the outcome between patients who had pneumocephalus after surgery and those who did not have pneumocephalus

## CONCLUSION

Chronic Subdural Heamatoma is more common in elderly and has equal gender distribution. Hemiparesis is most common presentation. Trauma is most common etiology while Diabetes mellitus is most common comorbidity of chronic SDH. Brain remaining at depth after surgery and postoperative pneumocephalus lead to higher chances of recurrence.

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