

# Single Parietal Burr-hole Craniostomy with Irrigation and Drainage for Unilateral Chronic Subdural Hematoma in Young Adults <40 Years: A Rationale behind the Procedure

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ABSTRACT

**Background:** Chronic subdural hematoma (CSDH) is one of the most common neurosurgical conditions. It is mostly a disease of elderly population with very little data about the young patients. There is also the debate regarding treatment strategies. We decided to determine the overall efficacy of the single burr-hole craniostomy (SBHC) for unilateral CSDH in young adults <40 years.

**Subjects and Methods:** We performed a retrospective study of young patients undergoing SBHC for unilateral CSDH between January 2013 and June 2016 at our institution. Medical records were assessed based on patient characteristics in the form of sex of the patient, etiology, presenting symptoms, comorbidities, and signs including Glasgow Coma Scale, computed tomography (CT) brain findings (site and thickness of SDH with midline shift), and intraoperative presence of chronic/subacute component. **Results:** Mean age of the patient was 33.69 years (range 18–40 years), mean thickness of SDH was 15.47 mm, and mean midline shift was 11.26 mm. 61.54% patients were male, trauma being the most common etiology (92.31%) with most common presenting complaint being headache (90.38% patients). 69.23% patients presented within 1 day of onset of symptoms. On CT scan, most of the patients were having SDH thickness between 11 and 20 mm (67.31%) with midline shift of 6–10 mm (53.85%). Right-sided SDH was present in 53.85%. Intraoperatively, 63.46% patients had subacute SDH whereas 34.61% had chronic component. There were total 2 recurrences (3.85%).

**Conclusions:** Young adults who present with unilateral CSDH usually have a history of trauma. They have shorter duration of symptoms and present mainly with the features of raised intracranial pressure such as headache and vomiting. SBHC with irrigation and drainage has excellent result for unilateral CSDH in young adults compared to other methods of drainage and should be considered treatment of choice unless contraindicated.

**KEYWORDS:** Chronic subdural hematoma, irrigation and drainage, single burr-hole craniostomy, young adults

## INTRODUCTION

Chronic subdural hematoma (CSDH) is one of the most common neurosurgical conditions with annual incidence of about 15.3 cases per 100, 000 population and is mostly a disease of elderly population. However, incidence of CSDH has been increasing in younger

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patients due to several clinical disorders that increase the risk of bleeding that include anticoagulant or antiplatelet therapy, hemodialysis, and systemic hematologic disease.<sup>[1,2]</sup>

Among neurosurgeons, preferred surgical method is also a matter of debate leading to lack of uniformity about the treatment strategies, such as the role of burr hole (single or double), twist drill, and craniotomy.

There is also disagreement about the use or disuse of drain and irrigation.<sup>[3,4]</sup> Although the surgical techniques are simple, recurrences remain one of the main challenges in the treatment.

Several studies reported the difference of clinical presentation and result of CSDH according to age. However, in most of the studies, number of young patients have been scarce to come to a solid conclusion.<sup>[5]</sup> More so, even if the number of patients were more, the patients were subjected to various surgical procedures according to the convenience and expertise of the operating surgeons rather than a single method.<sup>[6]</sup>

Hence, we preferred to study the outcome of single burr-hole craniostomy (SBHC) in young adults <40 years with CSDH which is the preferred method in our institute and being acceptable worldwide to have good outcome comparable to other methods<sup>[7-9]</sup> and also to describe characteristics of CSDH in terms of presenting symptoms, etiology, radiological features, intraoperative findings, and associated conditions in for those who underwent SBHC at our institute.

## SUBJECTS AND METHODS

We performed retrospective study of patients <40 years with unilateral CSDH who underwent SBHC with irrigation and drainage for evacuation of unilateral CSDH from January 2013 to June 2016 at our institute. During this period, we operated an overall of 455 unilateral CSDH by SBHC out of which only 52 patients were adults younger than 40 years (18–40 years) (11.42%). The patients with CSDH who underwent other surgical treatments, such as twist-drill craniostomy (TDC), double burr-hole craniostomy (DBHC), craniotomy, and evacuation of SDH, were excluded from this study. Patients with thickness of the SDH <5–10 mm associated with up to 5 mm midline shift with Glasgow Coma Scale (GCS) 15/15 and no neurological deficits were closely observed and procedure was performed only on clinical deterioration. Patients with bilateral CSDH were also excluded from the study.

Medical records were analyzed based on patient characteristics in the form of sex of the patient, etiology, presenting symptoms, comorbidities, and

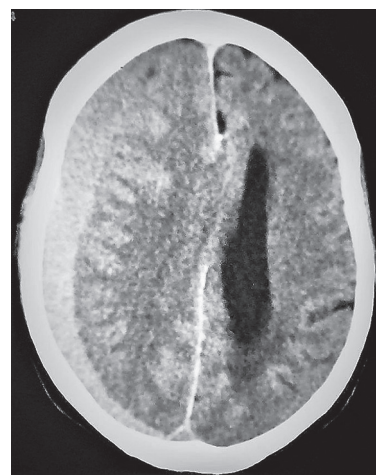
signs including GCS, computed tomography (CT) brain findings [Figure 1] (site and thickness of SDH with midline shift), intraoperative presence of chronic/subacute component.

Results were assessed by comparative analysis of patient symptoms and signs including GCS. Postoperative CT [Figure 2] was taken after drain removal and before discharge and thereafter at 1-month follow-up or earlier during the hospital stay if the patient's symptoms persisted. Postoperative CT taken at 1-month follow-up (when the follow-up was 100%) was included in the evaluation criteria of the procedure if the patient improved clinically postoperative. Subsequent follow-up visits gradually declined over time to 78.85% (41 patients). For those patients living far away, who could not visit regularly for subsequent follow-ups, communication was by telephone. Subsequently, CT brain was performed on recurrence of symptoms.

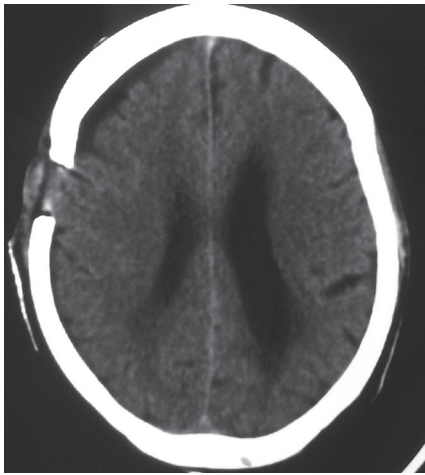
## RESULTS

Need for any redo surgical intervention or mortality due to surgery-related cause was considered to be failure.

For the 52 patients included in this study, mean age of the patient was 33.69 years (range 18–40 years), mean thickness of CSDH was 15.47 mm, and mean midline shift was 11.26 mm. 61.54% patients were male [Table 1], trauma being the most common etiology (92.31%) [Table 2] with most common presenting complaint being headache (90.38% patients) [Table 3]. 13 (25%) patients were alcoholic and 10 were smokers (19.23%) [Table 4]. 69.23% patients presented within 1 day of onset of symptoms [Table 5]. On CT scan, most of the patients were having SDH thickness between 11 and 20 mm (67.31%) [Table 6]



**Figure 1:** Preoperative computed tomography brain plain demonstrating isodense collection in right frontoparietal region suggestive of subacute subdural hematoma with mass effect over the right lateral ventricle with midline shift to left



**Figure 2:** Postoperative computed tomography brain plain demonstrating single burr hole over the right parietal area with complete evacuation of chronic subdural hematoma and resolution of mass effect and midline shift to left

with midline shift of 6–10 mm (53.85%) [Table 7]. Right-sided SDH was present in 53.85% [Table 8]. Intraoperatively, 65.38% patients had subacute SDH whereas 34.62% had chronic component [Table 9].

Fifteen of our patients preoperatively had hemiparesis and only two had GCS <8 (both had GCS E1V1M5) [Table 10], respectively. Even in these patients complete neurological recovery took place. There were total 2 recurrences (3.85%), one on the ipsilateral side whereas the other had recurrence on the opposite side. Both were dealt with redo surgery on their respective sides with the one on ipsilateral side required craniotomy due to active bleed [Table 11]. Both these patients also recovered fully neurologically after the second surgery during follow-up.

## DISCUSSION

CSDH in young adults <40 years is a rare entity. In younger population compared to elderly population, there is reduced brain–dura mater interface, which prevents cortico-dural vein disruption during acceleration and deceleration during trauma and thus leading to decreased chances of subdural collection in young adults. In our series, patients presented mainly with headache and vomiting which suggest raised intracranial pressure. Altered sensorium, paresis, and seizures were infrequent. Most of the patients presented early probably due to less space for the CSDH to expand before causing symptoms. Lower rate of recurrence, shorter symptom duration, and fewer leading signs such as hemispheric symptoms seen in our study are comparable to that in other similar studies [Table 12].

Most of the other studies [Table 12] have either only a few number of subjects in younger age group who underwent surgery for CSDH so as to draw a solid

**Table 1: Sex of the patient**

Sex of the patient	Number of patients (%)
Male	32 (61.54)
Female	20 (38.46)

**Table 2: Etiology**

Etiology	Number of patients (%)
Spontaneous	4 (7.69)
Trauma	48 (92.31)

**Table 3: Presenting complaints**

Presenting complaint	Number of patients (%)
Headache	47 (90.38)
Vomiting	28 (53.84)
Giddiness	8 (15.38)
Seizures	1 (1.92)
Altered sensorium	3 (57.62)
Hemiparesis/plegia	15 (28.84)

**Table 4: Previous medical comorbidities or drug intake or abnormal findings on blood investigations**

Comorbidities	Number of patients (%)
Diabetes mellitus	5 (9.61)
Hypertension	8 (15.38)
Cardiac disease	3 (5.77)
Cerebrovascular accident	1 (1.92)
Leukemia	1 (1.92)
Liver dysfunction	3 (5.77)
Psychotic disorder	1 (1.92)
Alcoholism	13 (25)
Smoking	10 (19.23)
Antiplatelet intake	2 (3.85)
Thrombocytopenia	2 (3.85)

**Table 5: Timing of surgery from the onset of symptoms**

Timing of surgery (days)	Number of patients (%)
1	36 (69.23)
2-3	6 (11.54)
4-7	9 (17.31)
>7	1 (1.92)

**Table 6: Thickness of chronic subdural hematoma**

Thickness (mm)	Number of patients (%)
Up to 10	8 (15.38)
11-20	35 (67.31)
21-30	9 (17.31)
>30	0

conclusion regarding the outcome. The series of Pragyam Sarma et al had 92 patients with complete records, which is one of the largest series in young patients in literature. However, in this study also, most of the

**Table 7: Midline shift**

Midline shift (mm)	Number of patients (%)
Up to 5	4 (7.69)
6-10	28 (53.85)
11-20	18 (34.61)
>20	2 (3.85)

**Table 8: Side of chronic subdural hematoma**

Side	Number of patients (%)
Right side	28 (53.85)
Left side	24 (46.15)

**Table 9: Intraoperative findings**

Findings	Number of patients (%)
Subacute component	34 (65.38)
Chronic component	18 (34.62)

**Table 10: Preoperative Glasgow Coma Scale**

GCS	Number of patients (%)
E4V5M6 (15/15)	28 (53.85)
13-14/15	15 (28.85)
8-12/15	7 (13.46)
4-7/15	2 (3.85)
3/15	0

GCS: Glasgow Coma Scale

**Table 11: Complications of the procedure**

Complications	Number of patients (%)
Minor wound infection	1 (1.92)
Postoperative pneumocephalus in CT	5 (9.61)
CSF hygroma formation	1 (1.92)
Recurrence on ipsilateral side requiring surgery	1 (1.92)
Recurrence on contralateral side requiring surgery	1 (1.92)
Mortality	0

CSF: Cerebrospinal fluid, CT: Computed tomography

patients underwent DBHC (48 patients) whereas single burr-hole procedure was performed in only 9 patients out of 92. They have also not mentioned in detail regarding recurrence in each of these procedures separately.<sup>[6]</sup>

Treatment through burr hole with irrigation and closed drainage is the most efficient, simple, and safe choice for surgical drainage of uncomplicated CSDH and is associated with low recurrence and lesser complications.<sup>[11,12]</sup> Choice of single or double burr hole varies from surgeon to surgeon. SBHC with irrigation and closed drainage is sufficient to evacuate CSDH with lower or similar recurrence rate as compared to two burr hole group according to most of the studies.<sup>[7-9]</sup>

According to one paper, the treatment of CSDH with single burr hole is associated with a significantly higher

postoperative recurrence rate, longer hospitalization length, and higher wound infection rate compared to that by double burr hole.<sup>[13]</sup> However, it is important to note that the subjects of this study were mostly old age ( $60 \pm 12$  years) and out of 97 CSDH, only 34 were treated with single burr-hole procedure; hence, it may not be true for young population which may have different presentations and comorbidities compared to older age. Moreover, the results depend on various other factors such as bleeding tendency, brain atrophy, preoperative GCS, alcohol abuse, bilateral CSDHs, higher hematoma density, postoperative air accumulation, and some technical aspects of surgery and so cannot be applied universally.<sup>[14-17]</sup>

On the other hand, SBHC is having recurrence rate compared to DBHC and has produced excellent results in our unit, especially in young patients. In young patients, brain expands rapidly during intraoperative period, hence obviating the need of double burr hole in most of the cases compared to the older population.<sup>[6]</sup> Moreover, most of the young patients present early and with thin CSDH which can be easily drained with single burr hole compared to older patients who have atrophic brain which allow accumulation of thick CSDH before the clinical manifestations set in.<sup>[5]</sup> Obviously, duration of surgery of CSDH by single burr hole is also less compared to double burr-hole technique as proposed by Lee *et al.* in 2009.<sup>[18]</sup>

TDC, on the other hand, takes much less time and can be performed under local anesthesia.<sup>[19]</sup> It is procedure of choice in high-risk surgical candidates in non-septated CSDH.<sup>[20]</sup> According to some studies, results of TDC are equivalent to burr-hole craniostomy in terms of recurrence rates, morbidity, and mortality.<sup>[21,22]</sup> One recently published study suggests that TDC should be considered a first-choice treatment option for CSDH, especially in elderly patients, while burr hole should be reserved for more complicated cases.<sup>[23]</sup> This may be true for elderly patients who usually have large CSDH with atrophic brain but not in case of young adults who have thin SDH with normal brain which tends to rapidly expand on drainage. If performed in young subjects, TDC carries the risk of brain penetration and inadequate drainage. Being a blind procedure, it may also lead to acute epidural hematoma formation due to injury to middle meningeal artery. Many studies have shown high recurrence rate with TDC compared to burr hole procedure.<sup>[24]</sup>

Hence, we recommend SBHC with irrigation and drainage for unilateral CSDH in young adults.

However, our main problem was lack of long-term personal visit by the patients in clinic. As many as

**Table 12: Comparison of various papers of chronic chronic subdural hematoma in young patient**

Study	Present study	Pragyan Sarma <i>et al.</i> , 2014 <sup>[6]</sup>	Won <i>et al.</i> , 2013 <sup>[5]</sup>	Gelabert-gonzález <i>et al.</i> , 2012 <sup>[10]</sup>
Total patients	52	92	15	42
Median age (range), years	33.69 (18-40)	29.21	-	29.9
Female sex (%)	20 (38.46)	15 (16.30)	1 (6.7)	10 (23.81)
Recurrence (%)	2 (3.85)	13 (14.13)	1 (6.7)	2 (4.76)
Trauma history (%)	48 (92.31)	79 (86)	13 (87)	-
Mean thickness (mm)	15.46	11	-	-
Right-left ratio	28/24	75/22	-	21/19
Midline shift (mm)	11.27	10	8.3	-
Symptoms (%)				
Headache	47 (90.38)	83 (90)	12 (80)	59.5
Vomiting	28 (53.85)	71 (77)	2 (13.33)	-
Hemiparesis	15 (28.85)	18 (20)	1 (6.67)	-
Altered sensorium	3 (5.77)	23 (25)	-	-
Seizures	1 (1.92)	-	-	21.4
Medical comorbidities (%)				
Diabetes	5 (9.61)	-	-	-
Hypertension	8 (15.38)	-	-	-
CAD	3 (5.77)	-	-	1 (2.38)
CVA	1 (1.92)	-	-	-
Hematological	3 (5.77)	13 (14.13)	3 (20)	5 (11.9)
Antiplatelets	2 (3.85)	-	1 (6.67)	1 (2.3)
Alcoholism	13 (25)	18 (19)	5 (33.33)	-
Smoking	10 (19.23)	-	-	-
Liver dysfunction	3 (5.77)	-	-	-
Psychotic disorder	1 (1.92)	-	-	-

CAD: Coronary artery disease, CVA: Cerebrovascular accident

11 patients (21.15%) did not comply with the advice of long-term personal visits beyond a few months. For those patients, we used telephonic communication. Nevertheless, all the patients who had any complaint attended in person for follow-up. Our patients, due to financial constraints, had no other option but to visit our center because of the lack of any other well-equipped tertiary care center in the locality which provides expert neurosurgery services free-of-cost.

## CONCLUSION

Young adults who present with unilateral CSDH usually have a history of trauma. They have shorter duration of symptoms and present mainly with the features of raised intracranial pressure such as headache and vomiting. SBHC with irrigation and drainage has excellent result for unilateral CSDH in young adults compared to other methods of drainage and should be considered treatment of choice unless contraindicated.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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