Comparative Study of Single Burr-Hole Craniostomy versus Twist-Drill Craniostomy in Patients with Chronic Subdural Hematoma

Abstract

Background: Chronic subdural hematoma (CSDH) is predominantly a disease of the elderly. On accounting its risk-to-benefit ratio, there was always controversy regarding the management of the CSDH as to which procedure is superior. **Aims:** The aim is to compare the clinical and radiological outcomes in patients of CSDH who have undergone single burr-hole craniostomy (BHC) versus twist-drill craniostomy (TDC). **Patients and Methods:** A retrospective study was conducted in patients admitted with CSDH who had undergone single BHC or TDC between January 2014 and December 2016. Patients between 18 and 90 years of age were selected. Patients with CSDH showing computed tomography (CT) scan findings of homogeneous hypodensity, homogeneous isodensity, and mixed density were selected. CT scan findings of CSDH with hyperdense gravity-dependent fluid level were also selected. Patients with CT evidence of multiple septations were excluded from the study. Recurrent CSDH, bilateral CSDH, and CSDH with secondary acute bleed were also excluded. Diagnosis was done using noncontrast CT scan. The maximum thickness of the CSDH was measured in the axial film of CT scan. The presence of midline shift (MLS) was measured as any deviation of the septum pellucidum from the midline in axial CT film. The mass effect was determined by the effacement of the sulci, sylvian fissure obscuration, or compression of lateral ventricles. The decrease in the signs and symptoms in postoperative period was considered as the postoperative clinical improvement. Improvement in the postoperative CT scan was determined by the decrease in the thickness of CSDH and absence of the MLS with decrease in the mass effect. The presence of the CSDH with mass effect and MLS was considered as the significant residue in the postoperative CT scan. Patients with significant residue underwent reoperation. **Results:** There were 63 patients in BHC group and 46 patients in TDC group. The mean age in BHC and TDC groups was 61.39 ± 13.21 standard deviation (SD) and 73.36 ± 10.82 SD, respectively. There were 48 (76.19%) male and 15 (23.81%) female in BHC group. There were 32 (69.57%) male and 14 (30.43%) female in TDC group. In BHC group, 41.27% were on the right side and 58.73% on the left side. In TDC group, 50% were on the right side and 50% on the left side. In BHC group, 82.54% were in the frontotemporoparietal region, 9.52% in the frontoparietal region, 6.35% in the temporoparietal region and 1.58% in the parietooccipital region. In TDC group, 86.95% were in the frontotemporoparietal region, 8.69% in the frontoparietal region, 2.17% in the temporoparietal region, and 2.17% in the parietooccipital region. There was no significant difference in duration of symptoms and history of trauma in both the groups. The symptoms of the patients in BHC versus TDC include weakness of the limbs (44.44% vs. 73.91%), headache (50.79% vs. 32.60%), altered sensorium or decreased memory (44.44% vs. 54.4%), vomiting (19.04% vs. 6.52%), speech abnormalities (15.87% vs. 19.56%), urinary incontinence (25.39% vs. 15.21%), seizure (1.58% vs. 4.34%), and diplopia (4.76% vs. 0%). The mean preoperative Glasgow Coma Scale (GCS) score in BHC versus TDC was 13.44 ± 2.23 SD versus 12.47 ± 2.95 SD limb weakness was noted in 52.38% BHC group and 82.60% TDC group. There was significantly decreased GCS score in TDC group. The number of the patients with limb weakness on affected side was significantly more in TDC group. The mean maximum thickness of the CSDH (in millimeter) in axial CT scan was 17.22 ± 4.29 SD in BHC group and 22.21 ± 4.52 SD in TDC group. The number of patients with MLS was 59 (93.65%) in BHC group and 45 (97.82%) in TDC group. There was significant difference in thickness of CSDH in both the groups. However, there was no significant difference in MLS in both the groups. There was no significant difference in prothrombin time, International Normalized Ratio, and activated partial thromboplastin time values of both the groups. There was significant difference in platelet counts of both the groups. The mean duration of procedure (in minutes) in BHC versus TDC was 79.20 ± 26.76 SD versus 27.47 ± 4.80 SD. The duration of procedure was significantly more in BHC compared to TDC. In postoperative assessment, there was no significant difference in the GCS score, power improvement, power deterioration, clinical improvement, and improvement in CT

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scans of both the groups. Postoperative CSDH residue requiring reoperation was significantly more in TDC group against the BHC group (13.04% vs. 1.58%). There was no significant difference in the development of acute subdural hematoma (SDH) (4.76% vs. 8.6%), reoperation rate (6.35% vs. 17.39%), complications (9.52% vs. 15.21%), and death (4.76% vs. 10.87%) in BHC group vs. TDC group. There was no significant difference in the period of hospital stay (days) in BHC (8.90 ± 5.89 SD) and TDC groups (7 ± 4.24 SD). **Conclusion:** The duration of procedure was significantly more in BHC than in TDC. In postoperative outcome, there was no significant difference in the GCS score, motor power improvement, motor power deterioration, overall clinical improvement, and improvement in CT scans of both the groups. Postoperative residue requiring reoperation was significantly more in TDC group. There was no significant difference in the development acute SDH, reoperation rate, complications, death, and hospital stay in both the groups. Avoiding the complications of general anesthesia and giving the equal postoperative improvement and complications of BHC, the TDC is considered as an effective alternative to the BHC in the surgical management of CSDH.

Keywords: *Burr-hole craniostomy, chronic subdural hematoma, computed tomography, twist-drill craniostomy*

Introduction

The dura is composed of fibroblasts and large amounts of extracellular collagen. The innermost part of the dura is formed by the dural border cell layer. The dural border cell layer is continuous with the inner (meningeal) portions of the dura and may be attached to the underlying arachnoid by an occasional cell junction. There is no evidence of the subdural space. It is suggested that the so-called subdural space is not a “potential” space since the creation of a cleft in this area of the meninges is the result of tissue damage.[1]

Chronic subdural hematoma (CSDH) is predominantly a disease of the elderly. It usually follows a minor trauma. A history of direct trauma to the head is absent in up to half the cases. The common manifestations are altered mental state and focal neurological deficit. Neurological state at the time of diagnosis is the most important prognostic factor. Morbidity and mortality is higher in the elderly, but outcome is good in patients who undergo neurosurgical intervention.[2]

CSDH is one of the most common clinical entities in daily neurosurgical practice. Gelabert- González *et al*. did a retrospective study (1980–2002) of the records of 1000 patients harboring 1097 CSDH treated with burr-hole craniostomy (BHC) with closed-system drainage. The series included 628 (62.8%) males and 372 (37.2%) females, age range 12–100 years, mean age 72.7 ± 11.4 years. The mean interval from trauma to appearance of clinical symptoms was 49.1 ± 7.4 days (15–751). The principal symptom was headache (29.7%) in the over 70s and behavioral disturbance (33.8%) in the under 70s. The CSDH was right sided in 432 patients, left sided in 471, and bilateral in the remaining 97 cases. Postoperative complications occurred in 196 patients and 21 patients died in hospital. Poor prognosis was related to patient’s age (>70) and clinical grade on admission.[3]

Rust *et al*. found that the risk of developing a CSDH was at least 42.5 times higher in warfarinized patients and also increased for patients on aspirin, although this risk could not be quantified.[4]

The published data regarding surgical technique for CSDH supports primary twist-drill craniostomy (TDC) drainage at the bedside for patients who are high-risk surgical candidates with nonseptated CSDH and craniotomy as a first-line evacuation technique for CSDH with significant membranes.[5]

Cenic *et al*. developed and administered a questionnaire to Canadian neurosurgeons with questions relating to the management of chronic and subacute subdural hematoma (SDH). Surgeons preferred one and two burr-hole craniostomy to craniotomy or twist-drill craniostomy as the procedure of choice for initial treatment of SDH (35.5% vs. 49.5% vs. 4.7% vs. 9.3%, respectively). Craniotomy and two burr-holes were preferred for recurrent SDH s (43.3% and 35.1%, respectively). Surgeons preferred irrigation of the subdural cavity (79.6%), use of a subdural drain (80.6%), and no use of anticonvulsants or corticosteroids (82.1% and 86.6%, respectively). They identified a lack of consensus with keeping patients supine following surgery and postoperative antibiotic use.[6]

Lee *et al*. analyzed data of 134 symptomatic CSDH patients who underwent TDC at the precoronal point (PCP) with closed-system drainage. They defined the PCP for TDC to be 1 cm anterior to the coronal suture at the level of superior temporal line. Of the 134 CSDH patients, 114 (85.1%) showed improved clinical performance and imaging findings after surgery. The catheters were inserted in the epidural space. Recurrent cases were seen in eight patients (5.6%), and they were improved with a second BHC with a closed-system operation. They concluded that, TDC at the PCP with closed-system drainage is safe and effective for patients with symptomatic CSDH whose hematomas extend beyond the coronal suture.[7]

Goyal *et al*. did a prospective, randomized, controlled study in 40 consecutive cases and divided randomly into two groups, one who was treated with burr-hole evacuation (BHE) and the other with twist drill evacuation (TDE). The results of BHE seem to be superior than TDE in terms of recurrence rate (5% vs. 15%), complication rate (15% vs. 20%), and mean Markwalder neurological grading score and mean Glasgow Coma Scale (GCS) at time of discharge (0.16 vs. 0.45 and 14.95 vs. 14.65, respectively). TDE seems to be better than BHE in terms of duration of hospital stay (7.4 vs. 8.05).

However, these differences were not statistically significant. TDE is having the advantage of being performed at bedside without the need of monitored anesthesia and anesthetist, time-saving, and least invasive. Overall results were comparable across both techniques without any significant difference.[8]

The authors compared the clinical and radiological outcomes in patients with CSDH who have undergone single BHC versus TDC.

Objectives of the study

The objective of this study is to compare the clinical and radiological outcomes in patients of CSDH who have undergone single BHC versus TDC.

Patients and Methods

The study was conducted in the Department of Neurosurgery, Government Medical College, Thrissur, Kerala, India, and approved by the Institutional Review Board of the Institution. The authors retrospectively compared the data of the patients of CSDH who had undergone Single BHC or TDC between January 2014 and December 2016. Patients between 18 and 90 years of age were selected. Patients with CSDH showing computed tomography (CT) scan findings of homogeneous hypodensity, homogeneous isodensity, and mixed density were selected. CT scan findings of CSDH with hyperdense gravity-dependent fluid level were also selected. Patients with CT evidence of multiple septations were excluded from the study. Recurrent CSDH, bilateral CSDH, and CSDH with secondary acute bleed were also excluded.

Radiological diagnosis of CSDH was done using noncontrast CT scan. The maximum thickness of the CSDH was measured in the axial film of preoperative CT scan. The presence of midline shift (MLS) was measured as any deviation of the septum pellucidum from the midline in axial CT film. The mass effect was determined by the effacement of the sulci, sylvian fissure obscuration, or compression of lateral ventricles.

Fresh frozen plasma, platelet transfusions, and Vitamin K were given before surgery to the patients who were taking anticoagulant/antiplatelet medications or if International Normalized Ratio (INR) was deranged. Unless it was an emergency, surgery was delayed until INR was corrected to $\leq$1.3. All the patients were treated with antiepileptic and third-generation cephalosporin medications. During the postoperative period in the hospital, the decrease in the signs and symptoms of CSDH was considered as the postoperative clinical improvement.

Postoperative CT scan was taken before discharge from the hospital. Improvement in the postoperative CT scan was determined by the decrease in the thickness of CSDH and absence of the MLS with decrease in the mass effect. Complete resolution of the CSDH was not taken as the criteria for the improvement in postoperative CT scan. Thickness of the CSDH in postoperative CT scan was not measured. The presence of the CSDH with mass effect and MLS was considered as the significant residue in the postoperative CT scan. Patients with significant residue underwent reoperation.

Parameters analyzed

The data for the study were collected from the medical records of the patients available in the medical records library and in the neurosurgery department. The data collected includes age, sex, duration of symptoms in days, history of trauma of any severity, clinical features, type of the procedure performed, prothrombin time (PT) in seconds, INR, activated partial thromboplastin time (APTT) in seconds, platelet counts per microliter of blood, use of antiplatelets or anticoagulants, comorbidities, history of chronic alcoholism, and duration of procedure and postoperative neurological status. Pre- and post-operative eye opening and verbal and motor scores of GCS were separately noted. But for statistical calculation, total GCS score were used. Pre- and post-operative motor power of the affected limbs was measured in the Medical Research Council grading. The thickness, location and side of CSDH, and presence of MLS in preoperative CT scan were noted. Improvement in postoperative CT scan and any occurrence of complications were noted. The presence of significant residual CSDH requiring reoperation was noted. Reoperation due to complication of surgery was noted. Duration of the hospital stay was also noted.

The data were entered in the Microsoft Excel sheets and statistically analyzed. Mann–Whitney U-test, standard error of proportion, and standard difference between two means and percentiles were used. Probability (P) value and Standard (Z) score were calculated. Probability (P) value of <0.05 and z score of >1.96 were considered as statistically significant.

Operative technique

In BHC group, patients were undergone surgery under general anesthesia with endotracheal intubation. A 4–5 cm vertical skin incision was put at superior temporal line near the coronal suture or at the maximum thickness of the CSDH. A 2.5 cm craniostomy was performed. Duramater and outer membrane of CSDH were opened with cruciate incision. CSDH was drained and irrigated with 500–1000 ml of 0.9% normal saline using 10FG infant feeding tube. Inner CSDH membrane and arachnoid were left undisturbed. Continuous nonsuction gravity dependent drain was kept 1 cm underneath the craniostomy site in subdural space and wound sutured in layers. Patients were kept supine for 24 h. The drain was removed after 24 h. CT scan was taken in postoperative period.

In TDC group, procedure was performed under local anesthesia in neurosurgery intensive care unit. After scalp preparation with povidone-iodine, local infiltration of scalp was done using 2% lignocaine with adrenalin. For frontotemporoparietal CSDH, 1 cm scalp incision was put and TDC was performed using hand drill [Figure 1] at a point 1 cm anterior or posterior to the coronal suture along the superior temporal line. For other locations, TDC was performed at the site of maximum thickness of the CSDH in axial CT scan. Dura mater and outer membrane of CSDH were pierced. 10FG infant feeding tube was inserted perpendicularly at a depth of 1–2 cm from the inner table and fixed to the scalp with suture [Figure 2]. The distal end of the infant feeding tube was connected to urinary drainage bag. Patient was positioned supine in neutral position. Continuous gravity-dependent drainage was kept. The drain was removed after 24 h and scalp stapled. CT scan was taken in postoperative period [Figure 3a and b].

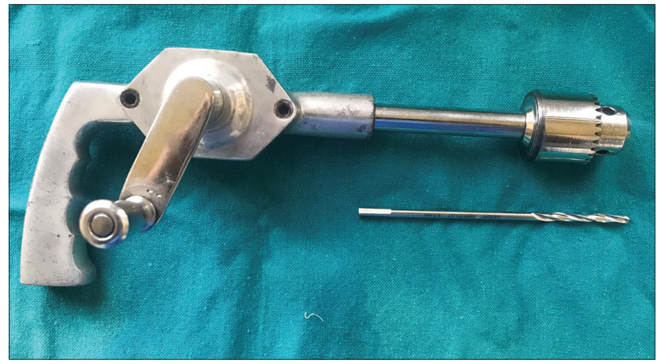

Figure 1: Hand drill and the drill bit used for twist-drill craniostomy

Figure 2: 10FG infant feeding tube was inserted at twist-drill craniostomy site and fixed to the scalp using suture

Results

There were 63 patients in BHC group and 46 patients in TDC group. The age in BHC group was 29–85 years with the mean age of 61.39 ± 13.21 standard deviation (SD). The age in TDC group was 46–90 years with the mean age of 73.36 ± 10.82 SD. There were 48 (76.19%) male and 15 (23.81%) female in BHC group. There were 32 (69.57%) male and 14 (30.43%) female in TDC group. In BHC group, 26 (41.27%) were on the right side and 37 (58.73%) on the left side. In TDC group, 23 (50%) were on the right side and 23 (50%) on the left side [Table 1]. In BHC group, 52 (82.54%) were in the frontotemporoparietal region, 6 (9.52%) in the frontoparietal region, 4 (6.35%) in the temporoparietal region, and 1 (1.58%) in the parietooccipital region. In TDC group, 40 (86.95%) were in the frontotemporoparietal region, 4 (8.69%) in the frontoparietal region, 1 (2.17%) in the temporoparietal region, and 1 (2.17%) in the parietooccipital region [Table 2].

The duration of symptoms was ranging from 1 to 30 days (mean 6.84 ± 7.57 SD) in BHC group and 1–60 days (mean 6.58 ± 10.45 SD) in TDC group. History of trauma was noted in 31 (49.20%) patients in BHC and 31 (67.39%) patients in TDC group. There was no significant difference in duration of symptoms and history of trauma in both the groups [Table 3]. The symptoms of the patients in BHC versus TDC includes weakness of the limbs (44.44% vs. 73.91%), headache (50.79% vs. 32.60%), altered sensorium or decreased memory (44.44% vs. 54.4%), vomiting (19.04% vs. 6.52%), speech abnormalities (15.87% vs. 19.56%), urinary incontinence (25.39% vs. 15.21%), seizure (1.58% vs. 4.34%), and diplopia (4.76% vs. 0%) [Table 4]. The preoperative GCS score was 7–15 (mean 13.44 ± 2.23 SD) in BHC group and 3–15 (mean 12.47 ± 2.95 SD) in TDC group. Limb weakness was noted in 33 (52.38%) patients in BHC group and 38 (82.60%) patients in in TDC group. There was significantly decreased GCS score in TDC group. The number of the patients with limb weakness on affected side was significantly more in TDC group [Tables 5 and 6].

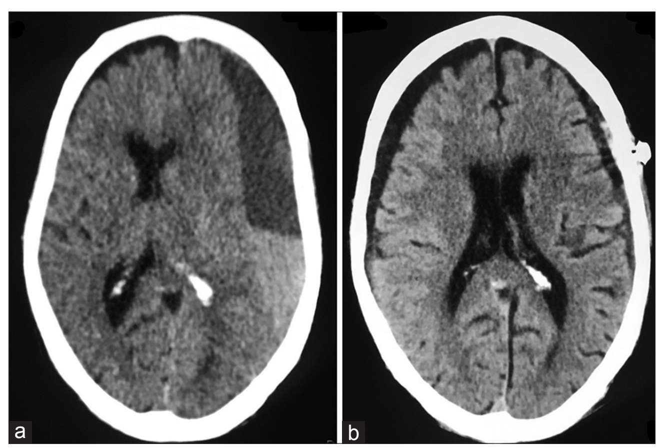

Figure 3: (a) Computed tomography scan showing left frontotemporoparietal chronic subdural hematoma with hyperdense gravity-dependent fluid level. (b) Computed tomography scan showing resolved left-sided chronic subdural hematoma following twist-drill craniostomy

The comorbidities in BHC versus TDC groups include coronary artery disease (7.93% vs. 17.39%), coronary artery disease (7.93% vs. 17.39%), cerebrovascular disease (9.52% vs. 15.21%), hypertension (15.87% vs. 47.82%),

Table 1: Numbers, age, sex, and side of patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

	BHC	TDC
n	63	46
Age, years (mean±SD)	29-85 (61.39±13.21)	46-90 (73.36±10.82)
Sex (%)		
Male	48 (76.19)	32 (69.57)
Female	15 (23.81)	14 (30.43)
Side (%)		
Right	26 (41.27)	23 (50)
Left	37 (58.73)	23 (50)

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; SD – Standard deviation

Table 2: Location of the chronic subdural hematoma in patients undergoing burr-hole craniostomy and twist-drill craniostomy

CSDH location	BHC (%)	TDC (%)
Frontotemporoparietal	52 (82.54)	40 (86.95)
Frontoparietal	6 (9.52)	4 (8.69)
Temporoparietal	4 (6.35)	1 (2.17)
Parietooccipital	1 (1.58)	1 (2.17)

CSDH – Chronic subdural hematoma; BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy

Table 3: Duration of symptoms and history of trauma in patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

	BHC	TDC	Statistics (*Z*, *P*)
Duration of symptoms, days (mean±SD)	1-30 (6.84±7.57)	1-60 (6.58±10.45)	1.18, >0.05
History of trauma (%)	31 (49.20)	31 (67.39)	1.64, >0.05

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; SD – Standard deviation; *P* – Probability value; *Z* score – Standard score

diabetes mellitus (22.22% vs. 28.26%), chronic obstructive pulmonary disease (4.7% vs. 8.69%), asthma (0 vs. 2.17%), pulmonary tuberculosis (0 vs. 2.17%), seizure disorder (1.58% vs. 4.34%), chronic kidney disease (6.35% vs. 2.17%), chronic liver disease (3.17% vs. 4.34%), psychiatric illness (4.76% vs. 2.17%), parkinsonism (0 vs. 2.17%), anemia (0 vs. 4.34%), hypothyroidism (0 vs. 4.34%), use of antiplatelets or anticoagulants (14.28% vs. 21.74%), and chronic alcoholism (9.52% vs. 15.21%) [Table 7].

The maximum thickness of the CSDH (in millimeter) in axial CT scan was 17.22 ± 4.29 SD in BHC group and 22.21 ± 4.52 SD in TDC group. The number of patients with MLS was 59 (93.65%) in BHC group and 45 (97.82%) in TDC group. There was significant difference in thickness of CSDH in both the groups. However, there was no significant difference in MLS in both the groups [Table 8]. The investigations in

Table 4: Symptoms of the patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

Symptoms	BHC (%)	TDC (%)
Weakness	28 (44.44)	34 (73.91)
Headache	32 (50.79)	15 (32.60)
Altered sensorium/memory loss	28 (44.44)	25 (54.4)
Vomiting	12 (19.04)	3 (6.52)
Speech abnormality	10 (15.87)	9 (19.56)
Urinary incontinence	16 (25.39)	7 (15.21)
Seizure	1 (1.58)	2 (4.34)
Diplopia	3 (4.76)	

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy

Table 5: Preoperative Glasgow Coma Scale score and motor weakness of limbs in patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

	BHC	TDC	Statistics (*Z*, *P*)
GCS score	7-15	3-15	2.04, <0.05
Score 3-8	4 patients	6 patients	
Score 9-13	18 patients	12 patients	
Score 14-15	41 patients	28 patients	
Mean±SD	13.44±2.23	12.47±2.95	
Median	15	14	
IQR	3	4.25	
Mode	15	14	
Limb weakness (MRC grading) (%)	33 patients (52.38)	38 patients (82.60)	2.96, <0.05

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; SD – Standard deviation; *P* – Probability value; *Z* score – Standard score; IQR – Interquartile range; GCS – Glasgow Coma Scale; MRC – Medical research council

Table 6: Number of patients and their preoperative motor power in affected side in patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

BHC		TDC	
Power (MRC grading)	Number of patients (%)	Power (MRC grading)	Number of patients (%)
Grade 0	8 (12.69)	Grade 0	10 (21.74)
Grade 1	2 (3.17)	Grade 2	5 (10.87)
Grade 2	1 (1.58)	Grade 3	10 (21.74)
Grade 3	7 (11.11)	Grade 4-	5 (10.87)
Grade 4-	5 (7.93)	Grade 4	7 (15.21)
Grade 4	10 (15.87)	Grade 4+	1 (2.17)
Grade 5	30 (47.62)	Grade 5	8 (17.39)

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; MRC – Medical Research Council

BHC versus TDC group were PT (14.08 ± 3.25SD vs. 14.99 ± 3.02 SD), INR (1.08 ± 0.18SD vs. 1.11 ± 0.16 SD), APTT (29.82 ± 6.04SD vs. 29.82 ± 6.04 SD), and platelet count (2.25 ± 0.89SD vs. 2.52 ± 0.72 SD). There was no significant difference in PT, INR, and APTT values of both the groups. There was significant difference in platelet counts of both the groups [Table 9].

The duration of procedure (in minutes) in BHC was 79.20 ± 26.76 SD and in TDC was 27.47 ± 4.80 SD. The duration of procedure was significantly more in BHC compared to TDC [Table 10]. The postoperative clinical statuses were assessed in BHC versus TDC groups. Postoperative GCS in BHC versus TDC groups was 14.81 ± 0.84SD versus 14.45 ± 1.86 SD. In patients with motor weakness of limbs, postoperative power was improved in 83.33% of BHC group and in 81.57% of TDC group. Postoperative power was deteriorated (including patients of complications and death) in 7.93% of BHC group and 10.86% TDC group. Clinical improvement was noted in 57 (90.47%) patients of BHC group and 39 (84.78%) patients of TDC group. There were no significant differences in the postoperative GCS score, postoperative power improvement, postoperative power deterioration, and clinical improvement of both the groups [Tables 11 and 12]. There was no significant difference in the improvement in postoperative CT scans of BHC versus TDC group (58 [92.06%] vs. 36 [78.26%]). Postoperative CSDH residue requiring reoperation was significantly more in TDC group against the BHC group (6 [13.04%] vs. 1 [1.58%]). There was no significant difference in the development of acute SDH in BHC (3 [4.76%]) and TDC (4 [8.6%]) groups [Table 13]. There was no significant difference in the reoperation rate (6.35% vs. 17.39%), complications (9.52% vs. 15.21%), and death (4.76% vs. 10.87%) in BHC group versus TDC

Table 7: Comorbidities of the patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

Comorbidities	BHC (%)	TDC (%)
CAD	5 (7.93)	8 (17.39)
CVA	6 (9.52)	7 (15.21)
HTN	10 (15.87)	22 (47.82)
DM	14 (22.22)	13 (28.26)
COPD	3 (4.76)	3 (8.69)
Asthma	0	1 (2.17)
Pulmonary TB	0	1 (2.17)
Seizure disorder	1 (1.58)	2 (4.34)
CKD	4 (6.35)	1 (2.17)
CLD	2 (3.17)	2 (4.34)
Psychiatric illness	3 (4.76)	1 (2.17)
Parkinsonism	0	1 (2.17)
Anaemia	0	2 (4.34)
Hypothyroidism	0	2 (4.34)
Antiplatelet/anticoagulation	9 (14.28)	10 (21.74)
Chronic alcohol	6 (9.52)	7 (15.21)

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; CAD – Coronary artery disease; CVA – Cerebrovascular accident; HTN – Hypertension; DM – Diabetes mellitus; COPD – Chronic obstructive pulmonary disease; TB – Tuberculosis; CKD – Chronic kidney disease; CLD – Chronic liver disease

Table 8: Preoperative computed tomography scan findings of the patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

	BHC (n=63)	TDC (n=46)	Statistics (P)
CT thickness of CSDH (mm) (mean±SD)	7-26 (17.22±4.29)	14-32 (22.21±4.52)	<0.05
Midline shift	59 present	45 present	>0.05
	4 absent	1 absent	
	93.65% present	97.82% present	

CSDH – Chronic subdural hematoma; BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; CT – Computed tomography; SD – Standard deviation; P – Probability value

Table 9: Investigations of the patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

Investigation	BHC	TDC	Statistics (Z, P)
PT (s)	10.3-27.9	11-22	1.88, >0.05
Mean±SD	14.08±3.25	14.99±3.02	
Median	13	14	
IQR	3	4.27	
Mode	12	12	
INR	0.8-1.9	0.84-1.64	1.37, >0.05
Mean±SD	1.08±0.18	1.11±0.16	
Median	1	1.06	
IQR	0.12	0.22	
Mode	1	1	
APTT (s)	12.5-47.4	13.1-53	0.418, >0.05
Mean±SD	29.82±6.04	31.19±7.97	
Median	28.4	28.65	
IQR	5.6	8.08	
Mode	28	26	
Platelet count (lakhs/µL)	0.45-4.8	1.4-4.4	2.05, <0.05
Mean±SD	2.25±0.89	2.52±0.72	
Median	2.2	2.445	
IQR	1	1.04	
Mode	2.2	2.4	

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; PT – Prothrombin time; INR – International Normalized Ratio; APTT – Activated partial thromboplastin time; SD – Standard deviation; P – Probability value; Z score – Standard score; IQR – Interquartile range

Table 10: Duration of burr-hole craniostomy and twist-drill craniostomy in patients with chronic subdural hematoma

	BHC	TDC	Statistics (Z, P)
Duration of the procedure, min (mean±SD)	30-180 (79.20±26.76)	20-37 (27.47±4.80)	14.99, <0.05

BHC - Burr-hole craniostomy; TDC – Twist-drill craniostomy; SD – Standard deviation; P – Probability value; Z score – Standard score

Table 11: Postoperative clinical status of patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

Postoperative clinical status	BHC	TDC	Statistics (*Z*, *P*)
GCS score	9-15	4-15	0.939, >0.05
Mean±SD	14.81±0.84	14.45±1.86	
Median	15	15	
IQR	0	0	
Mode	15	15	
Postoperative power improvement in patients with motor weakness (MRC grading)	30 improved out of 36 affected patients: 83.33%	31 improved out of 38 affected patients: 81.57%	0.2, >0.05
Postoperative power deterioration (MRC grading) (%)	5 (7.93)	5 (10.86)	0.43, >0.05
Clinical improvement (%)	57 (90.47)	39 (84.78)	0.76, ≥0.05

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; SD – Standard deviation; *P* – Probability value; *Z* score – Standard score; IQR – Interquartile range; GCS – Glasgow Coma Scale

group [Tables 14 and 15]. There was no significant difference in the period of hospital stay (days) in BHC (8.90 ± 5.89 SD) and TDC groups (7 ± 4.24 SD) [Table 16].

Discussion

CSDH is an important reversible cause of dementia and disability in the elderly. A sufficiently high level of clinical suspicion and prompt radiographic evaluation may allow for timely treatment to avoid poor outcomes. Thankfully, the routine use of CT scanning in most emergency facilities has made the diagnosis of these lesions commonplace.[9]

CSDH is a typical disease in elderly patients and encountered frequently in neurosurgical practice. With an increasing number of elderly people in the general population, there is a need to investigate risk factors (age, falls, and anticoagulant or antithrombotic therapy) which could be pertinent to the development of this disease. Baechli *et al*. reviewed 354 patients undergoing surgery for CSDH over a period of 7 years (1996–2002), the occurrence being equally distributed over these years. CSDH occurred more often in elderly (≤65 years) than in younger people (69 vs. 31%) and in men than in women (64 vs. 36%). Falls were reported in 77% of patients. There was a trend toward a higher risk of falls in the elderly. Antithrombotic or anticoagulant therapy was present in 41% of patients, 32% of them having had falls. Overall postoperative mortality was 0% and overall recurrence rate 13.6%. CSDH in the elderly population, especially in men, is frequently associated with falls and anticoagulation or antithrombotic therapy.[10]

Asghar *et al*. did a retrospective study on 40 cases of CSDH with >65 years. The incidence in this population was 8.2/100,000. Falls (57%) and antithrombotic therapy (33%) were the most frequent risk factors. The most common presenting features were altered mental state (52%) and focal neurological deficit (50%). 24 patients (60%) underwent surgical intervention with 4 deaths (17%). In the nonoperated group, mortality was 7/16 (44%). Most of the deaths in this series were due either to CSDH or to the complications of frailty and poor mobility. Surgery itself was generally successful.[11]

Table 12: Number of patients and their postoperative power in patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

BHC		TDC	
Power (MRC grading)	Number of patients (%)	Power (MRC grading)	Number of patients (%)
Grade 2	1 (1.66)	Grade 0	1 (2.43)
Grade 4	3 (5)	Grade 3	1 (2.43)
Grade 4+	5 (8.3)	Grade 4+	7 (17.07)
Grade 5	51 (85)	Grade 5	32 (78.04)

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; MRC – Medical Research Council

Table 13: Postoperative computed tomography scan finding in patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

	BHC	TDC (%)	Statistics (*Z*, *P*)
CT improvement	58 (92.06)	36 (78.26)	1.72, >0.05
Significant residue requiring reoperation	1 (1.58)	6 (13.04)	1.97, <0.05
Acute SDH	3 (4.76)	4 (8.69)	0.67, >0.05

SDH – Subdural hematoma; BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; CT – Computed tomography; *P* – Probability value; *Z* score - Standard score

Weigel *et al*. did a review based on a Medline search for CSDH surgery from January 1981 to October 2001. The articles were classified by three classes of evidence according to criteria of the American Academy of Neurology. 48 publications were reviewed. There was no article that provided Class I evidence. Six articles met criteria for Class II evidence and the remainder provided Class III evidence. Evaluation of the results showed that TDC and BHC are safer than craniotomy, BHC and craniotomy are the most effective procedures, and BHC has the best cure to complication ratio. Irrigation lowers

Table 14: Poor outcome of the patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

Poor outcome	BHC (%)	TDC (%)	Statistics (*Z*, *P*)
Reoperation	1 CSDH + 3 acute SDHs	6 CSDHs + 2 acute SDHs	1.51, >0.05
	Total: 4 (6.35)	Total: 8 (17.39)	
Complications	6 (9.52)	7 (15.21)	0.76, >0.05
Death	3 (4.76)	5 (10.87)	0.99, >0.05

CSDH – Chronic subdural hematoma; SDH – Subdural hematoma; BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; *P* – Probability value; *Z* score – Standard score

Table 15: Complications in the patients of chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

BHC	TDC
Seizure and hemiparesis. CSDH resolved	Acute SDH, DC
	Acute SDH treated conservatively
Respiratory tract infection and basal ganglia infarct. CSDH resolved	Acute SDH, DC, death
Bifrontal pneumocephalus, CSF leak, SSI, septicemia, death	Acute SDH, thrombocytopenia, hematemesis, increased INR, CLD, death
Acute SDH, DC, death	Respiratory complication, death. CSDH resolved
Acute SDH, DC, death	Respiratory complication, death. CSDH resolved
Acute SDH, DC, death	Respiratory complication, death. CSDH resolved

CSDH – Chronic subdural hematoma; SDH – Subdural hematoma; BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; DC – Decompressive craniectomy; CSF – Cerebrospinal fluid; SSI – Suture site infection; INR – International Normalised Ratio; CLD – Chronic liver disease

Table 16: Duration of stay of the patients with chronic subdural hematoma undergoing burr-hole craniostomy and twist-drill craniostomy

	BHC	TDC	Statistics (*Z*, *P*)
Stay in hospital, days (mean±SD)	3-30 (8.90±5.89)	1-21 (7±4.24)	1.83, >0.05

BHC – Burr-hole craniostomy; TDC – Twist-drill craniostomy; SD – Standard deviation; *P* – Probability value; *Z* score – Standard score

the risk of recurrence in TDC and does not increase the risk of infection. Drainage reduces the risk of recurrence in BHC, and a frontal position of the drain reduces the risk of recurrence. Drainage reduces the risk of recurrence in TDC and the use of a drain does not increase the risk of infection. BHC appears to be more effective in treating recurrent hematomas than TDC, and craniotomy should be considered the treatment of last choice for recurrences. TDC and BHC can be considered first-tier treatment, while craniotomy may be used as second-tier treatment.[12]

Camel *et al*. reviewed the case records of 114 patients to ascertain the efficacy of bedside twist-drill craniotomy and continuous closed-system catheter drainage for the treatment of CSDHs. Ninety-eight (86%) patients achieved an excellent outcome and seven (6%) had no significant improvement. The total mortality from all cases was 8% in this group. Successful catheter drainage of the CSDH was accomplished by either one or two catheter placements in 102 (90%) patients. Twelve patients required additional operative procedures. The mean duration of hospitalization for the study group was 16 days. No infections occurred in these patients. Remission of the clinical syndrome did not require the radiographic resolution of the CSDH.[13]

Jaiswal *et al*. in their study of 79 patients, 37 patients underwent BHC and 42 patients underwent TDC. Cure rate was higher in BHC group than TDC group, although it was not statistically significant. Duration of surgery was significantly higher in BHC group than TDC group. Thus, TDC is less time-consuming procedure and is procedure of choice in emergency situations. BHC and TDC, both the procedures, are comparable with respect to residual collection, recurrence, operative complications, morbidity and mortality. Reoperation should be considered in cases of residual collection only if there are persistent progressive symptoms with significant postoperative subdural collection. Age, gender, and clinical status at admission are important determinants of clinical outcome after surgery.[14]

In our study, the mean age in BHC and TDC groups were 61.39 ± 13.21 SD and 73.36 ± 10.82 SD, respectively. There were 76.19% male and 23.81% female in BHC group. There were 69.57% male and 30.43% female in TDC group. In BHC group, 41.27% were on the right side and 58.73% on the left side. In TDC group, 50% were each on either side. Frontotemporoparietal was the most common location in both the groups. There was no significant difference in duration of symptoms and history of trauma in both the groups. The most common symptoms in both the groups were focal neurological deficit, headache, and altered sensorium. The mean preoperative GCS score in BHC versus TDC was 13.44 ± 2.23 SD and 12.47 ± 2.95 SD, respectively. Limb weakness was noted in 52.38% of BHC group and 82.60% of TDC group. The CT scan thickness of CSDH is significantly more in TDC group. However, there was no significant difference in MLS in both the groups. The duration of procedure was significantly more in BHC compared to TDC. In postoperative outcomes, there was no significant difference in the GCS score, motor power improvement, motor power deterioration, overall clinical improvement, and improvement in CT scans of both the groups. The volume of residual CSDH following BHC or TDC was not measured. Postoperative CSDH residue requiring reoperation was significantly more in TDC group against the BHC group. There was no significant difference in the development acute SDH, reoperation rate, complications, death, and hospital stay in both the groups.

Conclusion

The most common symptoms of CSDH are weakness of the limbs, headache, and altered sensorium. The duration of procedure was significantly more in BHC than in TDC. In the postoperative outcome, there was no significant difference in the GCS score, motor power improvement, motor power deterioration, and overall clinical improvement of both the groups. There was no significant difference in the improvement in postoperative CT scans of both the groups. Postoperative residue requiring reoperation was significantly more in TDC group against the BHC group. There was no significant difference in the development acute SDH, reoperation rate, complications, death, and hospital stay in both the groups. Avoiding the complications of general anesthesia and giving the equal postoperative improvement and complications of BHC, the TDC is considered as an effective alternative to the BHC in the surgical management of CSDH.

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Conflicts of interest

There are no conflicts of interest.

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