

Original Research Article

A Comparative Study Of Twist Drill Craniotomy And Burr Hole Craniotomy In Patients Of Chronic Sub-Dural Hematoma Attending A Tertiary Care Centre Of Bihar**Prasoon Saurabh¹, Rishi Kant Singh^{2*}, Rohit Kumar³**¹Senior Resident, Department Of Neurosurgery, PMCH, Patna, Bihar, India²Assistant Professor, Department Of Neurosurgery PMCH, Patna, Bihar, India³Assistant Professor, Department Of Neurosurgery, PMCH, Patna, Bihar, India

Received: 25-11-2021 / Revised: 23-12-2021 / Accepted: 08-01-2022

Abstract

Introduction: Chronic subdural hematoma (CSDH) is one of the most commonly encountered neurosurgical conditions, common in elderly population. It may be associated with substantial morbidity and mortality and its incidence is estimated to be 13.1 cases per 100,000 populations in recent studies. This study aimed to compare recurrence rate, mortality, morbidity, surgical complications, and duration of hospital stay of these two procedures. **Methodology:** A study comparing burr hole craniostomy (BHC) with twist drill craniostomy (TDC) for unilateral hemispheric CSDH was carried out over a period of one year, from February 2021 to January 2022 in the Department of Neurosurgery, Patna Medical College & Hospital, Patna, Bihar. 50 unilateral CSDH patients of more than 10 mm thickness on CT scan were included, and thin CSDH, bilaterally significant CSDH, radiologically doubtful hygroma or empyema and infantile subdural collection were excluded. Two groups were randomly created out of these 50 cases with 25 patients each. Patients from one group A underwent BHC and patients of another group underwent TDC. All patients were followed up at 1, 3 and 6 months. Protocol was approved by the Institutional Ethical Committee and a written informed consent was obtained from each patient or next of kin before participation in the study was confirmed. All the statistical analysis was done using Statistical Package for Social Sciences (SPSS, Chicago) ver. 16.0. **Results:** The mean (SD) of the patients in groups TDC and BHC were 55.1(11.3) years and 57.5 (12.2) years, respectively. Overall, there was a male preponderance with a male to female ratio of 5.25:1. Most common predisposing factor was trauma (70%) followed by hypertension (14%), alcoholism (8%), Diabetes mellitus (6%) and only one patient (2%) had a history of anticoagulant use. On pre-operative assessment, mean GCS at admission in group TDC was 12.3 and that in group BHC was 13.1. Mean (SD) thickness of hematoma in both the groups were 24.1(4.3) mm and 22.4(5.1) mm, respectively. Mean (SD) midline shift was 12.1(3.2) mm and 10.3(2.9) mm in group TDC and BHC respectively. **Conclusion:** BHC and TDC both are equally effective procedures for chronic SDH with respect to recurrence rate, morbidity and mortality. Follow up up-to 3 months in cases of unilateral chronic subdural hematoma is sufficient.

Key Words: Comparative, Twist Drill Craniotomy, Burr Hole Craniotomy, Chronic Sub-Dural Hematoma

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Introduction

Chronic subdural hematoma (CSDH) is one of the most commonly encountered neurosurgical conditions, common in elderly population[1]. It may be associated with substantial morbidity and mortality and its incidence is estimated to be 13.1 cases per 100,000 populations in recent studies[2]. Surgical evacuation results in rapid improvement in neurological condition[3]. A wide range of surgical techniques with a variety of perioperative adjuvant procedures are currently used. Three most commonly used surgical techniques are burr hole craniostomy (BHC) (5- 30mm), twist drill craniostomy (TDC) (diameter 30 mm)[4].

While BHC is the most widely used procedure, TDC is an effective alternative with less invasiveness and good results[5, 6]. Weigel and coworkers in their evidence based meta-analysis have shown that both TDC and BHC have similar morbidity and mortality, but, recurrence rate is more with twist drill craniostomy (33% vs. 12.15%)[4]. The need for class I evidence to decide the superiority among these two commonly performed surgical techniques for chronic SDH has been repeatedly recognized and further evidence from randomized studies is required to guide the treatment. This study aimed to compare recurrence rate, mortality, morbidity, surgical complications, and duration of hospital stay of these two procedures.

Methodology

A study comparing BHC with TDC for unilateral hemispheric CSDH was carried out over a period of one year, from February 2021 to January 2022 in the Department of Neurosurgery, Patna Medical College & Hospital, Patna, Bihar. 50 unilateral CSDH patients of more than 10 mm thickness on CT scan were included, and thin CSDH, bilaterally significant CSDH, radiologically doubtful hygroma or empyema and infantile subdural collection were excluded. Two groups were randomly created out of these 50 cases with 25 patients each. Patients from one group A underwent BHC and patients of another group underwent TDC. All patients were followed up at 1, 3 and 6 months. Primary outcome variable was recurrence rate and other variables were morbidity, mortality, surgical complications, duration of hospital stay and cure rates. Protocol was approved by the Institutional Ethical Committee and a written informed consent was obtained from each patient or next of kin before participation in the study was confirmed. Preoperative clinical assessment was done using Glasgow coma scale (GCS). Post-operative assessment for statistical analysis was done on 5th post-operative day with these scales. Assessment at 1 month follow up period was done using Glasgow outcome scale. Patients were again interviewed at 3rd and 6th month for any clinical symptom. In preoperative CT scan, parameters recorded were maximum thickness of hematoma and midline shift. Postoperative CT scans were obtained on 5th postoperative day and at 1 month follow up, and apart from the above parameters, any complications like parenchymal injury or pneumocephalus were also noted. Patients who had residual collection at 1 month follow up were considered for CT scan at 3rd month follow up. Patients in TDC group underwent double (frontal and parietal) twist drill craniostomy (using

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a twist drill or hand held cranial perforator) under local anesthesia. Skull openings of stab incision with no.11 surgical blade, dura were opened with the sharp drill tip. Gradual egress of hematoma fluid was allowed. The subdural cavity was irrigated with saline using a soft silicon catheter. A closed system silicon drain was placed in frontal subdural space through the frontal trephination. Patients in BHC group underwent surgery under local anesthesia/monitored analgesia. Standard double burr hole craniostomy (>12 mm diameter) at frontal and parietal sites was performed. Subdural irrigation was done and subdural drain was kept for 48 hours. Surgical steps were similar in both the groups except the size of trephination.

Operational definitions

1. Residual hematoma: residual collection with any midline shift on 5th postoperative day CT scan.
2. Recurrence: clinically symptomatic ipsilateral residual collection on CT scan within 3 months of primary treatment which required reoperation.
3. Mortality: any death within 30 days of surgery and procedure related mortality as any complication during surgery leading to death in immediate postoperative period or during hospital stay.
4. Morbidity was considered as any procedure related complication during or after surgery other than recurrence and mortality (such as parenchymal injury, wound infection, seizures).

Statistical analysis

All the statistical analysis was done using Statistical Package for Social Sciences (SPSS, Chicago) ver. 16.0. Chi square test was done for comparison of proportional data. Mean values were compared using the 't' test for two variables. Confidence level of study was kept as 95%, hence 'p' value < 0.05 were considered significant.

Results

The mean (SD) of the patients in groups TDC and BHC were 55.1(11.3) years and 57.5 (12.2) years, respectively. Overall, there was a male preponderance with a male to female ratio of 5.25:1. Most common predisposing factor was trauma (70%) followed by hypertension (14%), alcoholism (8%), Diabetes mellitus (6%) and only one patient (2%) had a history of anticoagulant use. Presenting complaints were headache (64%), hemiparesis (54%) and symptoms of raised ICP viz vomiting, altered sensorium (48%), urinary incontinence (24%), gait ataxia (10%), memory loss (8%) and speech disturbances (4%). Groups were compared using 't' test and it was found that both the groups were comparable in terms of demographics, predisposing factors and presenting complaints.

On pre-operative assessment, mean GCS at admission in group TDC was 12.3 and that in group BHC was 13.1. Mean (SD) thickness of hematoma in both the groups were 24.1(4.3) mm and 22.4(5.1) mm, respectively. Mean (SD) midline shift was 12.1(3.2) mm and 10.3(2.9) mm in group TDC and BHC respectively.

Patients were discharged after post-operative CT scan on 5th post-operative day and a minimum duration of hospitalization was kept as 5 days. Mean hospital was 6.9 days and 6.1 days (p>0.05) in TDC and BHC groups respectively.

1st follow-up was done on 5th post-operative day. Mean (SD) GCS was 15.2 (0.7) and 14.1(2.6) in both the groups, respectively at 1st follow-up. This difference of GCS was non-significant (p value > 0.05). Radiologically, CT scan also showed non-significant difference between both the groups in hematoma thickness (p < 0.05) and midline shift (p < 0.05). 2nd follow-up was done at 1st month post-operative interval. GOS at 1st month follow-up was 87.3% and 95.2% in TDC and BHC groups respectively. Statistically, both the groups were similar. Mean thickness of hematoma and mean midline shift were also statistically similar in both groups. Difference between findings at 1st month follow-up and at admission was compared. Results have been shown in table 1.

Morbidity and mortality encountered among the patients of both the groups has been shown in table 2. No significant difference was observed for any of the parameters except pneumocephalus which was more in TDC group. All the cases of complications were managed conservatively. Pneumocephalus was seen but none had tension pneumocephalus and resolved spontaneously at 1 month follow up CT scan with the expansion of brain. All patients with episodes of seizure were given anticonvulsant treatment which was stopped after tapering in follow up period. The overall morbidity was 14% and 8% in TDC and BHC group respectively (p< 0.05). Overall mortality up-to 1 month follow up in our study was 2%. The deceased patient belonged to TDC group. No causality was reported in BHC group. The deceased patient had transtentorial herniation and at admission GCS was 4/15. Thus, there was no procedure related mortality. Radiologically, residual subdural collection was noted among 14 (28%) patients, overall. Out of these 14 patients, 9 belonged to TDC group and 5 belonged to BHC group. Majority (12/14) showed good clinical improvement, but 2 required reoperation due to persistent symptoms, one in each group. Residual hematoma in post-op CT showed significant association with preoperative midline shift (p < 0.05) but, no association with thickness of CSDH (p> 0.05).

Table 1: Comparison of both the groups based on finding at admission and on 1st month follow-up

Feature/Finding	At admission	On 1 st month follow-up	P value
Mean GCS/ mean GOS of 5			
TDC group	13.1	87.3%	<0.05
BHC group	12.3	95.2%	
Mean (SD) thickness of hematoma in mm			<0.05
TDC group	24.1(4.3)	2.5 (3.9)	
BHC group	22.4(5.1)	0.6 (1.9)	
Mean (SD) midline shift in mm			<0.05
TDC group	12.1(3.2)	0.2 (1.7)	
BHC group	10.3(2.9)	0.1 (0.9)	

Table 2: Comparison of morbidity profile of patients of both the groups

Morbidity	TDC group	BHC group
Pneumocephalus	4	2
Acute SDH	1	0
Parenchymal hematoma	2*	1*
Wound infection	0	1
Seizure	2*	1*

*patients of parenchymal hematoma presented with seizure

Discussion

Surgery is the standard treatment in symptomatic patients of CSDH and it significantly improves the outcome by immediate decompression of space occupying hematoma[4]. Three principal

surgical techniques based on size of trephination are Twist Drill Craniostomy (TDC); Burr Hole Craniostomy (BHC) and craniotomy[4]. Until the mid-1960s, craniotomy was the prevailing technique; Markwalder's review[7] on CSDH in 1981 was an

important step in minimizing the invasiveness of the surgical treatment. Hamilton and co-workers[8], Svein and Gelety[9], Robinson[10] and Markwalder et al[11] advocated only BHC for evacuation of CSDH. BHC is the most commonly performed procedure for CSDH within the past 20 years[4]. Additional adjuvant measures such as irrigation and drain insertion increase the number of treatment options. Only few studies have compared TDC and BHC[5, 6, 12, 13, 14]. Smely and coworkers[13] in their nonrandomized study in 1993, performed TDC in 33 consecutive patients prospectively and compared data with retrospective 33 patients of BHC, concluded TDC as better procedure. Horn and co-workers[6] carried out prospective nonrandomized study from August 2001 to October 2002 in 79 patients with 91 CSDH, with BHC in 24 and TDC in 55 patients, recommended TDC as the first line treatment of CSDH and reserved BHC and craniotomy for recurrent and unresponsive cases. Muzii and co-workers[12] carried out prospective randomized study in 47 patients, performed TDC in 22 patients and BHC in 24 patients had published their preliminary results. Gokmen and co-workers[5] carried out prospective randomized study with simple randomization in 70 patients from November 2002 to April 2006, and performed TDC in 38 patients and BHC in 32 patients, concluded that both the procedures are effective and comparable with respect to mortality, morbidity, surgical complications, duration of hospital stay and cure. Considering surgical procedure of these studies, Smely and co-workers[13] had performed single burr hole over the area of maximal hematoma width and irrigation with isotonic normal saline in BHC group and single twist drill trephination at maximal hematoma width and inserted extended subdural catheter without irrigation in TDC group.

There were 14 cases of residual collection in our study and except for 2 cases of recurrence, all other showed complete resolution in 3 months. Markwalder and coworkers[11] had also demonstrated persistent subdural collection in 78% of cases on 10th day of surgery after burr hole evacuation and closed system drainage. All his cases had complete resolution on CT scan by 2-3 months. Our study followed recommendation by Krauss JK[15], that residual fluid in subdural space in early post-operative CT scan is common and usually disappears on follow up examination in majority of patients and cases where hematoma increases, causes neurological deterioration or persistent or progressive headache should be considered for retreatment.

Weigel and co-workers[4] in their meta-analysis had shown average mortality 2.9% vs. 2.7%, Smely and co-workers[13] 6% and 9%, Horn and co-workers[6] 7% and 13%, Gokmen and co-workers[5] 2.6% and 3%, respectively in TDC and BHC group with no difference in groups except in study of Horn and co-workers[6] Mortality rates in our study groups was also similar. GCS at admission and GOS at 1 month showed significant association in our study, therefore, we suggest that preoperative GCS is an important predictor of operative mortality than the surgical method. Gokmen and co-workers[5], and Sanatarius and co-workers[3] have predicted the same.

Weigel and co-workers[4] had demonstrated 3% vs. 3.8% morbidity, Horn and co-workers[6] 36% vs 33% overall complication rate, Gokmen and co-workers[5] 2.7 and 0% morbidity respectively in TDC and BHC group without significant difference, similar to Muzii and coworkers[12]. Morbidity in our study was also similar ($p > 0.05$). Our TDC group had slightly increased morbidity due to higher number of surgical complications which might be contributed as surgery was performed by novel residents under the expert guidance in the department.

Conclusion

BHC and TDC both are equally effective procedures for chronic SDH with respect to recurrence rate, morbidity and mortality. Pre-operative CT scan findings of chronic SDH i.e. density of hematoma and midline shift are predictors of residual subdural collection in postoperative CT scan. Re-operation should be considered in cases of residual collection only if there are persistent progressive symptoms

or deterioration. Follow up up-to 3 months in cases of unilateral chronic subdural hematoma is sufficient.

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