Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2018/181

Original Article

Comparison of Management Strategies in Chronic Subdural Hematoma: A Retrospective Study

S Senthilkumar[1], K Rajaraajan[2], G Rajasekaran[3]

[1]Post Graduate, Department of Neurosurgery, Madurai Medical College, Madurai, Tamil Nadu, India, [2]Assistant Professor, Department of Neurosurgery, Madurai Medical College, Madurai, Tamil Nadu, India, [3]Associate Professor, Department of Neurosurgery, Madurai Medical College, Madurai, Tamil Nadu, India

Abstract

Introduction: Chronic subdural hematoma is one of the most common diseases encountered in neurosurgical practice. Although surgical drainage is an established treatment option for symptomatic patients, the ideal surgical approach remains controversial. The superiority of one modality over the other remains to be established.

Aim: This study aims to compare burr hole tapping and craniotomy in the management of chronic subdural hematoma.

Materials and Methods: A retrospective analysis of 100 cases of chronic subdural hematoma admitted in our institution was done. The type of procedure, operative duration, post-operative stay, reoperation, post-operative Glasgow coma scale, and mortality were analyzed using Chi-square test.

Results: The ideal procedure for each patient is shown based on the analysis of various parameters and their statistical significance is interpreted.

Conclusion: The ideal surgical option for chronic subdural hematoma has been highlighted based on the studied parameters. The best possible benefit to the patient has been elucidated.

Key words: Burr hole, Chronic subdural hematoma, Craniotomy

INTRODUCTION

Chronic subdural hematoma is one of the most common diseases encountered in neurosurgical practice. The condition can be easily diagnosed on plain computed tomography (CT) scans. The reported incidence is approximately 3/100,000 and rises appreciably in the elderly population.[1]

Chronic sub-dural hematoma was first reported by Wepfer in 1657. It was initially thought of as a form of stroke in the 17th century. Later it was considered as an inflammatory disease in the 19th century and as traumatic in the early 20th century. We now know that trauma is not the mandatory precursor of this condition.

Access this article online

www.ijss-sn.com

Month of Submission : 04-2018
Month of Peer Review : 05-2018
Month of Acceptance : 06-2018
Month of Publishing : 06-2018

Although surgical drainage is an established treatment option for symptomatic patients, the ideal surgical approach remains controversial.[2] The procedures adopted in the surgical management for the treatment of chronic subdural hematomas (CSDHs) include twist drill craniostomy, single or multiple burr hole drainage, burr hole trephination, and craniotomy.[3]

Recent articles state that burr hole drainage is a superior technique compared to twist drill craniostomy and craniotomy due to a lower incidence of recurrence and morbidity.[3-6] However, no Class I data comparing these treatments[3] have been established to eliminate the debate over the optimal surgical approach.

The clinical outcome of a particular surgical procedure depends on various other factors which have to be addressed to determine the ideal approach.

At our institution, the surgical drainage procedures presently being performed to treat CSDH are burr hole washout, decompressive craniotomy, burr hole trephination, and

Corresponding Author: Dr. K Rajaraajan, 3, Raja Street, Pasupathy Nagar, Madurai, Tamil Nadu, India. Phone: +91-9443325635. E-mail: rajaraajan@yahoo.com

"mini"-craniotomy. Proponents for performing a craniotomy argue that the wide exposure allows for loculations to be broken up and membranes to be opened, which, in turn, leads to increased amount of subdural drainage and decrease in recurrence rates.[7,8] The aim of this study was to compare burr hole drainage and craniotomy in the management of chronic subdural hematoma and to determine their clinical benefits.

Aim of the Study

The aim of the study was as follows:

1. To compare the burr hole drainage and craniotomy in management of chronic subdural Hematoma
2. To establish the optimum procedure for the given patient
3. To establish statistical significance in selection of procedure
4. To aid in prognostication of surgery for chronic subdural hematoma.

MATERIALS AND METHODS

Study Group

This study was conducted at the Department of Neurosurgery, Madurai Medical College, Madurai, from January 1, 2016, to June 31, 2017. 100 patients who underwent surgical drainage of a chronic subdural hematoma were retrospectively selected. Of 100 patients, 60 patients underwent burr hole tapping and 40 patients underwent various types of craniotomy which includes mini-craniotomy, decompressive craniotomy, and burr hole trephination.

Table 1: Age-wise distribution

Age in years	Group		Total
	Burr hole	Craniotomy	
<45	11	2	13
>60	27	17	44
45–60	22	21	43
Total	60	40	100

Table 2: Chi-square tests for age

	Value	df.	Asymptotic significance (two-sided)
Pearson Chi-square	4.715[a]	2	0.095
Likelihood ratio	5.148	2	0.076
Number of valid cases	100		

Table 3: Sex distribution

Sex	Burr hole	Craniotomy	Total
Female	7	5	12
Male	53	35	88
Total	60	40	100

Method Used

The initial CT scan performed on arrival and the 24 h post-operative CT scan were studied.

The volume of subdural hematoma in the initial CT was measured using the formula AxBxC/2, where A, B, and C represent the dimensions in three axes perpendicular to each other.[9] The change in the clot volume on the pre- and post-operative CT scans was calculated and recorded. The difference was then computed and the percentage of the clot removed was determined.

Medical records were reviewed for patient demographics.

The following parameters were also noted from patient records:

1. Glasgow coma scale (GCS) preoperatively on the 1st post-operative dayand at discharge were noted.
2. Admission and discharge Rankin disability score
3. Pre-operative comorbidities
4. Use of anticoagulation/antiplatelet therapy
5. History of alcohol abuse
6. Time in the operating room.

Various factors that are considered to be risk factor of CSDHs such as head trauma, underlying disease having bleeding tendency, and medications that alter coagulation status were corrected before surgery.

Table 4: GCS score distribution

	Burr hole group	Craniotomy	Total
GCS			
<7	3 (5.0)	1 (2.5)	4 (4.0)
8–12	29 (48.3)	10 (25.0)	39 (39.0)
>13	28 (46.7)	29 (72.5)	57 (57.0)
Total			
Count	60	40	100

GCS: Glasgow coma scale

Table 5: GCS score cross tabulation

	Value	Df.	Asymptotic significance (two-sided)
Pearson Chi-square	6.535[a]	2	0.038
Likelihood ratio	6.699	2	0.035
Linear-by-linear association	5.796	1	0.016
Number of valid cases	100		

GCS: Glasgow coma scale

Table 6: Reoperation group cross tabulation

Reoperation	Burr hole group	Craniotomy	Total
No	50	38	88
Yes	10	2	12
Total	60	40	100

Table 7: Chi-square tests for reoperation

Parameter	Value	Df.	Asymptotic significance (two-sided)	Exact significant (two-sided)	Exact significant (one-sided)
Pearson Chi-square	0.050[a]	1	0.824		
Continuity correction[b]	0.000	1	1.000		
Likelihood ratio	0.050	1	0.823		
Fisher's exact test				1.000	0.527
Number of valid cases	100				

Reoperation was done, 10 cases in burr hole group and 2 cases in craniotomy

Table 8: Reoperation in age wise

Reoperation rate	Burr hole group	Craniotomy
<40 years	Nil	Nil
41–60	2	1
>61	8	1

Table 9: Operative time - cross tabulation

Time (min)	Burr hole group	Craniotomy	Total
<50	56	6	62
50–100	4	25	29
>100	0	9	9
Total	60	40	100

Table 10: Operative time - Chi-square tests

Chi-square tests	Value	df.	Asymptotic significance (two-sided)
Pearson Chi-square	63.052[a]	2	0.000
Likelihood ratio	71.909	2	0.000
Linear-by-linear association	56.298	1	0.000
Number of valid cases	100		

Table 11: Post-operative stay - cross tabulation

	Burr hole group	Craniotomy	Total
≤10 days	54	26	80
>10 days	6	14	20
Total	60	40	100

The choice of operation was based solely on the surgeon's preference and clinical experience.

Statistical Methods

The following statistical methods were used.

The data were analyzed using the Chi-square test.

OBSERVATIONS AND RESULTS

Patients undergoing burr hole tapping will be grouped as Group 1 and craniotomy as Group 2 hereinafter.

In the age group of <45 years, 11 patients in burr hole group and two patients in craniotomy group [Table 1].

In the age group between 45 and 60 years, 22 patients in burr hole group and 21 patients in craniotomy group.

In the age group of >60 years, 27 patients in burr hole group and 17 patients in craniotomy group.

P value of age group is 0.095 which is statistically not significant [Table 2].

The mean age in burr hole group is 57.5 years of age and mean age in craniotomy group is 59.45 years.

Of 60 patients in burr hole group, 53 are male patients and seven are female patients [Table 3]. Of 40 patients in craniotomy group, 35 patients are male patients and five patients are female patients.

Three patients in burr hole group and one patient in [Table 4 and 5] craniotomy group presented in GCS <7, 29 patients in burr hole group and 10 patients in craniotomy group presented in GCS 8–12, and 28 patients in burr hole group and 29 patients in craniotomy group presented in GCS >13.

Reoperation was less in craniotomy group when compare to burr hole group, but $P = 0.824$ which is statistically not significant.

Reoperation is needed more in the age group of above 60 years, especially in the burr hole tapping group [Table 6 and 8].

Operative time is less for burr hole tapping group, most of the cases are finished before 50 min, *P* value for operative is <0.001 which is statistically highly significant.

Post-operative stay is <10 days seen in 54 patients in burr hole tapping and 26 patients in craniotomy groups. $P = 0.002$ which is statistically significant

Table 12: Chi-square tests post-operative stay

	Value	df.	Asymptotic significance (two-sided)	Exact significant (two-sided)	Exact significant (one-sided)
Pearson Chi-square	9.375[a]	1	0.002		
Continuity correction[b]	7.878	1	0.005		
Likelihood ratio	9.275	1	0.002		
Fisher's exact test				0.004	0.003
Linear-by-linear association	9.281	1	0.002		
Number of valid cases	100				

Table 13: Death in each group cross tabulation

Outcome	Burr hole group	Craniotomy	Total
Death	10	14	24
Discharged	50	26	76
Total	60	40	100

Table 14: Chi-square tests for death

	Value	df.	Asymptotic significance (two-sided)	Exact significance (two-sided)	Exact significance (one-sided)
Pearson Chi-square	4.423[a]	1	0.035		
Continuity correction[b]	3.475	1	0.062		
Likelihood ratio	4.353	1	0.037		
Fisher's exact test				0.055	0.032
Number of valid cases	100				

Table 15: Procedure wise - cross tabulation

Procedure	Death	Discharged	Total
Burr hole tapping	10	50	60
Burr hole trephination	2	1	3
Craniotomy	7	13	20
Decompressive craniectomy	3	2	5
Mini-craniotomy	2	10	12
Total	24	76	100

Table 16: Death in age wise

Age	Burr hole	Craniotomy
40	1	4
40–60	3	4
>60	6	6

Table 17: Comorbidities

Comorbidities	Burr hole group	Craniotomy group
Bleeding diathesis	18	10
Heart disease	28	8
DM	5	3
HT	32	18
Others	5	3

Ten patients were dead in burr hole group and 14 patients were dead in craniotomy group. *P* value for death cross tabulation is 0.035 which is statistically not significant.

DISCUSSION

Chronic subdural hematoma is a common disease encountered in neurosurgical practice. The various surgical procedures such as twist drill craniostomy, burr hole drainage, and craniotomy result in varying degrees of reoperation rates from 5% to 27.8%[10-13] as well as varying morbidity and mortality rates. However, due to the discrepancy in clinical outcome of each surgical intervention, there is an ongoing debate over optimal surgical treatment [Table 7].

Hamilton *et al.*[14] concluded that there was no significant difference in the incidence of post-operative complications, hematoma recurrence, or operative mortality among the different surgical groups. Mondorf *et al* [15]. described a comparison between craniotomy and burr hole treatments where the number of craniotomy patients more than tripled that of the burr hole group.[15] He reported craniotomy remains a valid and safe technique for the management of patients with chronic subdural hematoma. [Table 9 and 10]

Sambasivan compares 2300 cases of CSDH where over 2200 are treated with craniotomy and only 51 with burr hole drainage [Table 11 and 12].[13] They concluded that an extended surgical approach with partial membranectomy has no advantages regarding the rate of reoperation and the outcome. However, Lee *et a*l. compared 38 patients with burr hole drainage to 13 treated with craniotomy[11] [Tables 13-16] and inferred that as initial treatment, burr hole drainage with irrigation of the hematoma cavity and closed-system drainage is recommended. Extended craniotomy with membranectomy is reserved for instances of acute rebleeding with solid hematoma.

The surgical technique for "mini-craniotomy" involved raising a craniotomy flap of about 5–7 cm in greatest diameter centered over the area of maximal hematoma thickness. The outer membrane was opened and excised as far as the craniotomy edges and then the inner membrane would be excised.

In cases of burr hole and tapping, the burr hole was placed in the frontal region at the Kocher's point and the other placed at the parietal eminence. The outer membrane was opened and irrigation was performed until clear effluent.

The primary endpoints of the study included reoperation rates and mortality. Secondary endpoints involved length of post-operative stay and morbidity as measured by post-operative and discharge Glasgow coma score, and discharge disposition. The data collection concluded when the patient was either discharged or expired. There was no long-term follow-up.

In addition, there were a higher number of post-operative complications for craniotomy in our data, specifically related to post-operative infections, acute hemorrhage, and metabolic disturbances. Mortality associated with both procedures was comparable. With similar morbidity and mortality rates, our data support burr hole washout over craniotomy for the treatment of CSDH in elder patients. In case of reoperation, mini-craniotomy was superior to burr hole tapping and decompressive craniotomy.

The secondary endpoints of the study, the average length of stay, and average time in the operating room were compared. The results show that burr hole tapping as a better procedure compared to craniotomy as there was shorter duration of hospitalization (7.7 vs. 11.1 days) and less time spent in the operating room. (48.8 vs. 129.4 min).

The major limitations of our study remain that this is a retrospective study and includes relatively small number of patients when compared to other studies. Due to the retrospective nature, there is a lack of long-term follow-up in our study. As it may be difficult to generalize the conclusions from the smaller sample size, the difference in patient safety requires further investigation. Future long-term multi-institutional, prospective studies are needed to fully demarcate the differential outcomes due to procedure choice [Table 17].

CONCLUSION

In the age group of <60 years, burr hole tapping appears to be superior to craniotomy for the treatment of CSDH with respect to patient outcome, operating time, length of stay, and recurrence. In our study, older age group had more recurrence rates with burr hole tapping when compare to craniotomy. In that case of reoperation, mini-craniotomy was superior to burr hole tapping and decompressive craniotomy. However, in case of severe comorbid conditions such as heart disease, renal diseases, and lung disorders, initial burr hole tapping may be appropriate.

Mini-craniotomy appears superior to other procedures in elder patients, whereas burr hole tapping is optimal method in younger adult subjects, but future long-term prospective, multicenter studies are needed.

REFERENCES

1. Santarius T, Lawton R, Kirkpatrick PJ, Hutchinson PJ. The management of primary chronic subdural haematoma: A questionnaire survey of practice in the United Kingdom and the Republic of Ireland. Br J Neurosurg 2008;22:529-34.
2. Cenic A, Bhandari M, Reddy K. Management of chronic subdural hematoma: A national survey and literature review. Can J Neurol Sci 2005;32:501-6.
3. Weigel R, Schmiedek P, Krauss JK. Outcome of contemporary surgery for chronic subdural haematoma: Evidence based review. J Neurol Neurosurg Psychiatr 2003;74:937-43.
4. Liu W, Bakker NA, Groen RJ. Chronic subdural hematoma: A systematic review and meta-analysis of surgical procedures. J Neurosurg 2014;121:665-73.
5. Kutty SA, Johny M. Chronic subdural hematoma: A comparison of recurrence rates following burr-hole craniostomy with and without drains. Turk Neurosurg 2014;24:494-7.
6. Juan WS, Tai SH, Hung YC, Lee EJ. Multiple tenting techniques improve dead space obliteration in the surgical treatment for patients with giant calcified chronic subdural hematoma. Acta Neurochir (Wien) 2012;154:707-10.
7. Torihashi K, Sadamasa N, Yoshida K, Narumi O, Chin M, Yamagata S, *et al*. Independent predictors for recurrence of chronic subdural hematoma: A review of 343 consecutive surgical cases. Neurosurgery 2008;63:1125-9.
8. White M, Mathieson CS, Campbell E, Lindsay KW, Murray L. Treatment of chronic subdural haematomas-a retrospective comparison of minicraniectomy versus burrhole drainage. Br J Neurosurg 2010;24:257-60.
9. Lisk DR, Pasteur W, Rhoades H, Putnam RD, Grotta JC. Early presentation of hemispheric intracerebral hemorrhage: Prediction of outcome and guidelines for treatment allocation. Neurology 1994;44:133-9.
10. Ernestus RI, Beldzinski P, Lanfermann H, Klug N. Chronic subdural hematoma: Surgical treatment and outcome in 104 patients. Surg Neurol 1997;48:220-5.
11. Lee JY, Ebel H, Ernestus RI, Klug N. Various surgical treatments of chronic subdural hematoma and outcome in 172 patients: Is membranectomy

necessary? Surg Neurol 2004;61:523-7.
12. Mori K, Maeda M. Surgical treatment of chronic subdural hematoma in 500 consecutive cases: Clinical characteristics, surgical outcome, complications, and recurrence rate. Neurol Med Chir (Tokyo) 2001;41:371-81.
13. Sambasivan M. An overview of chronic subdural hematoma: Experience with 2300 cases. Surg Neurol 1997;47:418-22.
14. Hamilton MG, Frizell JB, Tranmer BI. Chronic subdural hematoma: The role for craniotomy revaluated. Technique and application. Neurosurgery 1993;33:67-72.
15. Mondorf Y, Abu-Owaimer M, Gaab MR, Oertel JM. Chronic subdural hematoma--craniotomy versus burr hole trepanation. Br J Neurosurg 2009;23:612-6.

How to cite this article: Senthilkumar S, Rajaraajan K, Rajasekaran G. Comparison of Management Strategies in Chronic Subdural Hematoma: A Retrospective Study. Int J Sci Stud 2018;6(3):77-82.

Source of Support: Nil, **Conflict of Interest:** None declared.