

Recurrence of CSHD after Single Burr-Hole Evacuation and Closed Drainage System Versus Double Burr Hole Evacuation and Closed Drainage System

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ABSTRACT

Objective: The recurrence rate was compared after single burr hole evacuation and closed drainage system versus double burr hole evacuation and closed drainage system of CSHD.

Material and Methods: A randomized controlled trial conducted at the Neurosurgery unit, Lahore General Hospital for 6 months period. Sixty cases were included and randomized into two equal groups. Patient fulfilling the inclusion criteria were enrolled through the emergency and outdoor. CT scan brain was done and site, size and thickness of CSDH were evaluated. Patient were treated in exactly the same way as per standard ward routine practice except that the treatment option (whether to use the single or double burr hole) was decided through randomization by using random tables, Group A with single burr hole and Group B with double burr hole with closed drain used in both cases. Patients were kept admitted in the hospital till they were fit go home. Each patient was followed for recurrence at the 15th day, 1 month, 2 months and finally at 03 months.

Results: Total 60 patients of chronic subdural hematoma were included. Total cases were divided into two equal groups with 30 cases in group A (single burr hole) and 30 cases in group B (two burr holes). The mean age of all patients was 59 yrs with SD \pm 12 with minimum age 40 yrs and maximum age 80 yrs. There were 19 (32%) cases in age group of 40-49 yrs, 17 (28%) cases in age group 50-59, 10 (17%) cases in age group 60-69 and 14 (23%) cases in age group 70 yrs & above. There were 51 (85%) male and 9 (15%) female patients. There were 25 male cases & 5 female cases treated with single burr hole while 26 male & 4 females were included in two burr hole group. The study results showed that the mean thickness of hematoma was 2.2 ± 0.7 cm and rate of recurrence increased with increase in thickness of hematoma. The volume of CSDH varied markedly with mean volume of 90ml. There was also increased recurrence with increase in volume of hematoma. Total of 60 cases of CSDH were operated with 30 cases in group A (one burr) and 30 cases in group B (two burr). There was recurrence in 6 patients of group A and 5 patients of group B. The recurrence in group A was 20% and group B 16% with overall recurrence rate of 18%. While there was no recurrence in 24 (80%) patients of group A and 25 (84%) patients of group B. The statistical difference between two groups is insignificant (p-value 0.131).

Conclusion: Most of the patients (82%) had recovered after burr-hole craniostomy. However, some patients (18%) suffer recurrence of hematoma. No significant difference in recurrence of CSDH with one burr hole or two burr holes and was found and also noticed that the rate of recurrence is to some extent lower with double burr hole than with one burr hole evacuation of chronic subdural hematoma.

Key Words: Chronic subdural hematoma, Burr-hole craniostomy.

Abbreviations: CSDH: Chronic Subdural Hematoma.

INTRODUCTION

A chronic subdural hematoma (CSDH) is a blood assemblage on the surface of brain, under outer cover of the dura. Bleeding is usually due to a head injury. The incidence rate is quite higher in older population and the estimated range is 3.4 to 8.58 per 100,000 population in patients with more than 65 years of age and younger than 65 years.¹⁻³

Owing to better health care facilities, there is worldwide increase in geriatric population. There are so many reasons when the patients with increased age get traumatized on head and because of this the prevalence and incidence is continuously on rise. These patients are more prone to have CSDH after mild head injury.⁴⁻⁵

The process of formation of CSDH starts soon after the mild head injury when it causes to accumulate clotted old blood in between two layers (brain and duramater). The disease follows a benign process but due to its chronic nature it is associated with high rates of hospitalization which can be cured and treated by surgical techniques.^{3,6,7}

The causes, clinical features and therapeutic management are well established but no consensus is yet made over different surgical options. Although CSDH is a benign disease, CSDH tends to occur in older age groups, who often have other co-morbidities that contribute to morbidity related to CSDH. Whatever surgical approach is used, recurrence remains the most common complication. Therefore, accurate assessment of the problems such as complication, recurrence and related factors are important.⁸⁻¹⁰

This study was done to compare the frequency of recurrence of CSDH with single burr hole and closed drain versus double burr hole and closed drain. This study will help in establishing surgical guidelines to manage CSDH.

MATERIALS AND METHODS

A randomized controlled trial was conducted at the Neurosurgery unit of Lahore General Hospital for 6 months period. Sixty cases were included and randomized into two equal groups. All patients aged between 40 to 80 years and both sexes presented with symptomatic chronic subdural hematoma having headache, change in conscious level or hemiparesis proven by CT scan were included in this study. Those patients who did not consent to participate, recurrent cases, and patients in whom surgery other than burr

hole evacuation is indicated were excluded from the study.

DATA COLLECTION AND ANALYSIS

All patients were included who fulfilled the inclusion criteria. The study was duly approved from the ethical committee of the hospital. The patients were admitted through the outpatient and emergency department of Lahore General Hospital. Informed consent for inclusion in the study and surgical procedure will be taken from each patient. A detailed history and clinical information was collected. Patient will be requested to sign informed consent. They will be assured for the confidentiality and expertise for each procedure and will be educated regarding better outcome. Two groups (A & B) were made from randomization by lottery method. In group A, the procedure for single burr hole with continuous drainage will be as follows:

Under local or general anesthesia a single burr hole will be made, Dura mater and external membrane of hematoma will be incised. Using a soft catheter subdural space irrigated with warm saline (body temperature) till clear fluid starts returning through the same burr hole. Wound will be closed in layers and drain will be left in situ for 2 days.

While in group B two burr holes will be done at two sites on the chronic subdural hematoma and soft catheter will be passed through one burr hole for irrigation while fluid will be drained through other burr hole till clear fluid starts draining.

Drain will be left in situ for 2 days and wound will be closed in layers. Closed drainage system will be attached to the free end of the drain in both groups. All surgeries will be done by a single surgeon.

Patient will be nursed in the flat position for 48 hours after surgery and drain will be removed after 48 hours and patient will be discharged when his symptoms alleviate and no further neurosurgical care required. They will be followed for the next 3 months, initially weekly for 1 month then monthly for the next 2 months. Both techniques will be assessed in terms of recurrence (according to operational definition) during the follow up. All this information will be recorded in a performa attached. The collected information was entered and analyzed in SPSS.²³ Age was presented as mean \pm S.D and gender and recurrence were presented as frequency and percentages. Both groups were compared for the frequency of recurrence of hematoma by using chi square test taking P value ≤ 0.05 as significant. Data was stratified in terms of

age, gender, GCS at the time of admission and size (in terms of thickness and volume) of hematoma.

RESULTS

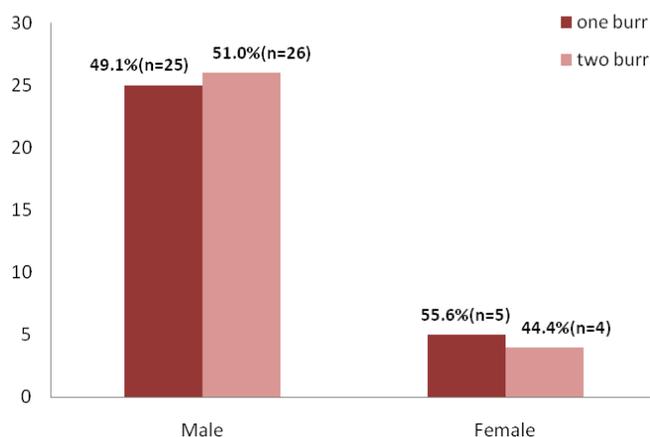
In this study, total of 57 patients were studied with 3 patients having bilateral CSDH thus making total number of hematomas 60 that were operated upon. The age range in study was 40-80 years. The mean age of all patients was 59 ± 12 years. There were 85% male cases while remaining 15% counted for the female group making male to female ratio 5.6:1. Baseline demographic characteristics presented in table 1.

Table 1: Baseline characteristics of Patients with Chronic Subdural Hematoma (N = 60).

		N	%
Gender	Male	51	85.0
	Female	9	15.0
Age (Years)	40-49	19	31.7
	50-59	17	28.3
	60-69	10	16.7
	≥ 70	14	23.3
	Chronic Subdural hematoma		
	1 burr	30	50.0
	2 burr	30	50.0
Thickness(cm)	1.0	9	15.0
	1.5	7	11.7
	2.0	19	31.7
	2.5	4	6.7
	3.0	19	31.7
	4.0	2	3.3
	Size (ml)	0-50	6
51-100		35	58.3
101-150		16	26.7
151-200		2	3.3
≥ 200		1	1.7
Glasgow Coma Scale		7 - 9	7
	10-12	19	31.7
	13-15	34	56.7

Further distribution of patients in different age groups operated by single or double burr hole is shown in table 2. Further analysis shows that 25 (49.1%) male cases & 5 (55.6%) female cases were treated with single burr while 26 (51.0%) male & 4 (44.4%) females were included in two burr hole group, figure 1.

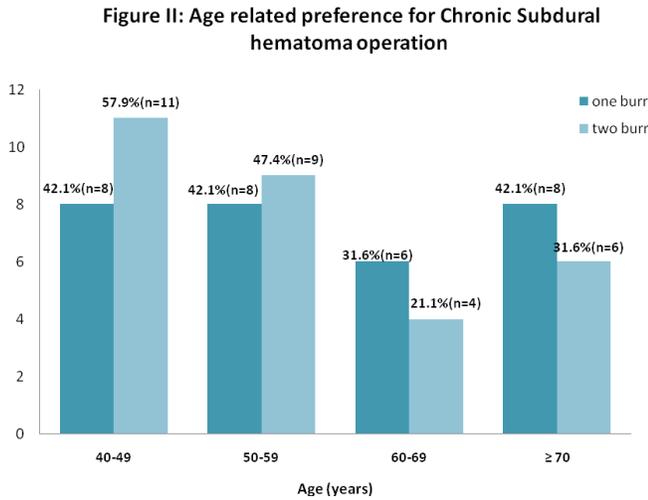
Figure 1: Gender difference and burr type



The study results showed that the mean thickness of hematoma was 2.2 ± 0.7 cm and frequency of different sizes as shown in table 1. The recurrence rate was also analyzed on basis of thickness of hematoma which shows that incidence of recurrence was increased with thickness of hematoma from 0% in 1cm thickness to 100% in 4cm thickness of hematoma, table 3.

Table 2: Age Distribution in Two Groups.

		Chronic Subdural Hematoma		Total
		One Burr	Two Burr	
AGE (years)	40-49	8	11	19
	50-59	8	9	17
	60-69	6	4	10
	70 & above	8	6	14
	Total	30	30	60



2.5	3 (75.0)	1 (25.0)
3	15 (78.9)	4 (21.1)
4	1 (50.0)	1 (50.0)
Size (ml)		
0-50	6 (100)	0 (0)
51-100	31 (88.6)	4 (11.4)
101-150	11 (68.8)	5 (31.2)
151-200	0 (0.0)	2 (100.0)
≥ 200	1 (100.0)	0 (0.0)
Glasgow Coma Scale		
7 - 9	4 (57.1)	3 (42.9)
10-12	16 (84.2)	3 (15.8)
13-15	29 (85.3)	5 (14.7)

The volume of CSDH varied markedly with mean of 90ml. The analysis of size (volume) of hematoma to the recurrence was done. There was marked increase in incidence of recurrence with increase in size of hematoma. The recurrence was 0 (0%) in size of hematoma up to 50 ml which raised to 4(12%) in 50-100ml range with further higher recurrence in 100-150 ml and 150-200ml range accounting for 5 (45%) and 2 (100%) respectively, table 3. The GCS of patients in study and its relation to outcome has been shown in table 3.

Total of 60 cases of CSDH were operated with 30 cases in group A (one burr) and 30 cases in group B (two burr). There was recurrence in 6 patients of group A and 5 patients of group B. thus the recurrence in group A was 20% and group B 16% with overall recurrence rate of 18%. While there was no recurrence in 24 (80%) patients of group A and 25 (84%) patients of group B, table 3.

Table 3: Association between Chronic Subdural Hematoma and recurrence frequency.

	Recurrence*	
	No N(%)	Yes N(%)
Chronic Subdural hematoma		
1 burr	24 (80.0)	6 (20.0)
2 burr	25 (83.3)	5 (16.7)
Thickness(cm)		
1	9 (100.0)	0 (0.0)
1.5	7 (100.0)	0 (0.0)
2	14 (73.7)	5 (26.3)

DISCUSSION

Chronic subdural hematoma (CSDH) is a benign condition that can lead to significant morbidities chronically. Around 60% cases of CSDH used to report from the cases of head injuries with a mean time of six weeks between occurrence of a head injury and appearance of clinical symptoms. There is a great provocation of trauma in older patients due to the poor outcomes as compared to younger ones. A mild-head injury can develop the condition of chronic subdural hematoma in more than 20% of elder patients.^{3,11,12}

Bilateral subdural hematomas are also common in infants due to the absence of adhesions in the subdural space on birth, which form with the age. A child abuse is a cause of an interhemispheric subdural hematoma. Moreover, an increase in age alters the atrophy of the brain which leads to its shrinkage in mass, whereas, on the other hand, it also causes an increased in stretching of the bridging brain veins which are more prone to get damaged in advancing age even with mild head injury.¹³⁻¹⁶

Patients with CSDH have various signs and symptoms while the present in hospital. The most common and frequent being the altered level of consciousness, headache, gait abnormalities, and sometimes may present with motor deficit.^{17,18}

After history and clinical presentation computed tomography of brain is the modality of choice to initially establish the diagnosis. Recent advanced CT scans can also differentiate between acute of chronic collection of blood. These patients after diagnosis immediately considered for surgical removal of clotted blood. There are several surgical techniques which surgeons can use to drain the subdural hematoma

amongst all the burr hole craniostomy is the most acceptable and safest method of treatment which can be performed along with drain or without drain.^{19,20}

The different surgical techniques develop different situations, as the reoccurrence rate of subdural hematoma is higher in twist drill craniotomy, while morbidity rate is higher but higher rates of morbidity when compared with burr hole craniostomy. The overall rate of reoccurrence is ranging from 5 – 30%.²¹⁻²³

The patients who were treated with burr-hole craniostomy with closed drainage had experienced a significant reduction in the recurrence rate.²⁴⁻²⁶ Controversy exists in the required number of burr holes to drain CSDH. A study included 76 patients with 21 bilateral hematomas were treated with burr hole craniostomy. Double burr hole was done in 63 while in 34 single burr holes were done. Recurrence rate was 29% in single burr hole group, while it was 5% in double burr group.²⁷⁻²⁹

Another international study conducted on 180 patients and post op recurrence was compared in single and double burr hole treated patients. Postoperative recurrence rate together in two groups was 5.6%. There were 51 patients treated with one burr hole and in only 1 (2%) patient had recurrence. Double burr hole was done in 129 patients and 9 (7.0%) patients had recurrence of CSDH. The cases of burr holes were not statistically linked with the postoperative recurrence rate. The two burr holes treatments showed a high recurrence rate as compared to single burr hole.³⁰

In a study, the mean age of all the patients who presented with CSDH was 59 years.^{31,32} In our study there were 51 (85%) male and 9 (15%) female patients. These results show a relatively higher incidence of CSDH in male than female as compared to older studies. Male patients also report a higher incidence of chronic subdural hematoma.³³⁻³⁶

The main objective of this study was to determine recurrence rate of CSDH after 3 months of surgery. There were total 60 CSDH operated and only 11 (18%) patients had recurrence. Out of these 11 patients 6 (20%) belong to the one burr hole group while 5 (16%) belong to two burr hole group. Other 49 CSDH did not show any symptoms or signs of recurrence in the follow up period of 3 months. The statistical difference between two groups was insignificant (p-value = 0.131) but the number of recurrence was somewhat higher in group A as compared to group B. The study shows that the results of CSDH drainage by

single vs. double burr hole are comparable but there is somewhat reduced recurrence with double burr hole as compared to single burr hole. The overall rate of recurrence of CSDH in our study is comparable to the results in previous studies that is 7%-18%.³⁶⁻⁴⁰

CONCLUSION

Most of the patients (82%) had recovered with burr-hole craniostomy and closed drainage evacuation of CSDH. However, some patients (18%) suffered recurrence of hematoma. It is concluded that there is no significant difference between one or two burr-hole evacuation of CSDH in terms of recurrence. Although in this study, the rate of recurrence was slightly lower with double burr hole than with one burr-hole evacuation of chronic subdural hematoma. Studies with larger sample size are required to solve the mystery of controversy. Significant factors should be identified which can lead to either high or low recurrence rates from the treatments. This can be beneficial in selecting appropriate surgical procedure according to the type of CSDH.

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REFERENCES

1. Montano N, Stifano V, Skrap B, Mazzucchi E. Management of residual subdural hematoma after burr-hole evacuation. The role of fluid therapy and review of the literature. *J Clin Neurosci.* 2017 Sep. 5.
2. Soleman J, Kamenova M, Guzman R, Mariani L. The Management of Chronic Subdural Hematoma Patients Treated with Low-dose Acetylsalicylic Acid: An International Survey of Practice. *World Neurosurg.* 2017 Aug. 21.
3. Uno M, Toi H, Hirai S. Chronic Subdural Hematoma in Elderly Patients: Is This Disease Benign? *Neurol Med Chir (Tokyo)*, 2017 Aug. 15; 57 (8): 402-9.
4. Matsumoto H, Hanayama H, Okada T, Sakurai Y, Minami H, Masuda A, et al. Clinical investigation of chronic subdural hematoma with impending brain herniation on arrival. *Neurosurg Rev.* 2017 May 20.
5. Oh CW. Erratum: Risk Factor Analysis for the Recurrence of Chronic Subdural Hematoma: A Review of 368 Consecutive Surgical Cases. *Korean J Neurotrauma*, 2017 Apr; 13 (1): 61.
6. Bartek J, Jr., Sjavik K, Kristiansson H, Stahl F, Fornebo

- I, Forander P, et al. Predictors of recurrence and complications after chronic subdural hematoma surgery: a population-based study. *World Neurosurg.* 2017 Jul. 19.
7. Katsigiannis S, Hamisch C, Krischek B, Timmer M, Mpotsaris A, Goldbrunner R, et al. Independent predictors for functional outcome after drainage of chronic subdural hematoma identified using a logistic regression model. *J Neurosurg Sci.* 2017 Jul. 12.
 8. Jafari N, Gesner L, Koziol JM, Rotoli G, Hubschmann OR. The Pathogenesis of Chronic Subdural Hematomas A Study on the Formation of Chronic Subdural Hematomas and Analysis of Ct Findings. *World Neurosurg.* 2017 Jul. 25.
 9. Kanyi JK, Ogada TV, Oloo MJ, Parker RK. Burr-Hole Craniostomy for Chronic Subdural Hematomas by General Surgeons in Rural Kenya. *World J Surg.* 2017 Jul. 24.
 10. Chandran RS, Nagar M, Sharmad MS, Prabhakar RB, Peethambaran AK, Kumar S, et al. Single Parietal Burr-hole Craniostomy with Irrigation and Drainage for Unilateral Chronic Subdural Hematoma in Young Adults < 40 Years: A Rationale behind the Procedure. *J Neurosci Rural Pract.* 2017 Jul; 8 (3): 389-94.
 11. Soleman J, Kamenova M, Lutz K, Guzman R, Fandino J, Mariani L. Drain Insertion in Chronic Subdural Hematoma: An International Survey of Practice. *World Neurosurg.* 2017 Aug; 104: 528-36.
 12. Gelabert-Gonzalez M, Roman-Pena P, Aran-Echabe E. Chronic subdural hematoma in the oldest-old population. *Neurosurg Rev.* 2017 Apr. 7.
 13. Desai VR, Scranton RA, Britz GW. Management of Recurrent Subdural Hematomas. *Neurosurg Clin N Am.* 2017 Apr; 28 (2): 279-86.
 14. Vega RA, Valadka AB. Natural History of Acute Subdural Hematoma. *Neurosurg Clin N Am* 2017 Apr; 28 (2): 247-55.
 15. Abecassis IJ, Kim LJ. Craniotomy for Treatment of Chronic Subdural Hematoma. *Neurosurg Clin N Am* 2017 Apr; 28 (2): 229-37.
 16. Yang W, Huang J. Chronic Subdural Hematoma: Epidemiology and Natural History. *Neurosurg Clin N Am.* 2017 Apr; 28 (2): 205-10.
 17. Castellani RJ, Mojica-Sanchez G, Schwartzbauer G, Hersh DS. Symptomatic Acute-on-Chronic Subdural Hematoma: A Clinicopathological Study. *Am J Forensic Med Pathol.* 2017 Jun; 38 (2): 126-30.
 18. Brennan PM, Koliass AG, Joannides AJ, Shapey J, Marcus HJ, Gregson BA, et al. The management and outcome for patients with chronic subdural hematoma: a prospective, multicenter, observational cohort study in the United Kingdom. *J Neurosurg.* 2017 Mar 17: 1-8.
 19. Xu CS, Lu M, Liu LY, Yao MY, Cheng GL, Tian XY, et al. Chronic subdural hematoma management: clarifying the definitions of outcome measures to better understand treatment efficacy - a systematic review and meta-analysis. *Eur Rev Med Pharmacol Sci.* 2017 Feb; 21 (4): 809-18.
 20. Dziejcz TA, Kunert P, Marchel A. Clinical Course and Results of Surgery for Chronic Subdural Hematomas in Patients on Drugs Affecting Hemostasis. *J Korean Neurosurg Soc.* 2017 Mar; 60 (2): 232-8.
 21. Yang W, Huang J. Chronic Subdural Hematoma: Epidemiology and Natural History. *Neurosurg Clin N Am.* 2017 Apr; 28 (2): 205-10.
 22. Kale A, Oz II, Gun EG, Kalayci M, Gul S. Is the recurrence rate of chronic subdural hematomas dependent on the duration of drainage? *Neurol Res.* 2017 May; 39 (5): 399-402.
 23. Toi H, Kinoshita K, Hirai S, Takai H, Hara K, Matsushita N, et al. Present epidemiology of chronic subdural hematoma in Japan: analysis of 63,358 cases recorded in a national administrative database. *J Neurosurg.* 2017 Feb. 3: 1-7.
 24. Avanali R, Bhadrans B, Krishna KP, Vijayan A, Arun S, Musthafa AM, et al. Chronic Subdural Hematoma: A Questionnaire Survey of Management Practice in India and Review of Literature. *World Neurosurg.* 2016 Dec; 96: 355-61.
 25. Iftikhar M, Siddiqui UT, Rauf MY, Malik AO, Javed G. Comparison of Irrigation versus No Irrigation during Burr Hole Evacuation of Chronic Subdural Hematoma. *J Neurol Surg A Cent Eur Neurosurg.* 2016 Sep; 77 (5): 416-21.
 26. Gelabert-Gonzalez M, Rico-Cotelo M, Aran-Echabe E. [Chronic subdural hematoma]. *Med Clin (Barc)* 2015 Jun. 8; 144 (11): 514-9.
 27. Kanyi JK, Ogada TV, Oloo MJ, Parker RK. Burr-Hole Craniostomy for Chronic Subdural Hematomas by General Surgeons in Rural Kenya. *World J Surg.* 2017 Jul. 24.
 28. Chandran RS, Nagar M, Sharmad MS, Prabhakar RB, Peethambaran AK, Kumar S, et al. Single Parietal Burr-hole Craniostomy with Irrigation and Drainage for Unilateral Chronic Subdural Hematoma in Young Adults <40 Years: A Rationale behind the Procedure. *J Neurosci Rural Pract.* 2017 Jul; 8 (3): 389-94.
 29. Abecassis IJ, Kim LJ. Craniotomy for Treatment of Chronic Subdural Hematoma. *Neurosurg Clin N Am* 2017 Apr; 28 (2): 229-37.
 30. Han HJ, Park CW, Kim EY, Yoo CJ, Kim YB, Kim WK. One vs. Two Burr Hole Craniostomy in Surgical Treatment of Chronic Subdural Hematoma. *J Korean Neurosurg Soc.* 2009 Aug; 46 (2): 87-92.
 31. Juratli TA, Klein J, Schackert G. [Chronic subdural hematoma in the elderly]. *Chirurg.* 2017 Feb; 88 (2): 131-5.
 32. Brennan PM, Koliass AG, Joannides AJ, Shapey J, Marcus HJ, Gregson BA, et al. The management and outcome for patients with chronic subdural hematoma: a prospective, multicenter, observational cohort study in the United Kingdom. *J Neurosurg.* 2016 Nov. 11: 1-8.

33. Choi JJ, Kim HS, Lee KC, Hur H, Jo YY. Prediction of in-hospital mortality and morbidity using high-sensitivity C-reactive protein after burr hole craniostomy. *J Anesth.* 2016 Dec; 30 (6): 956-60.
34. Yadav YR, Parihar V, Namdev H, Bajaj J. Chronic subdural hematoma. *Asian J Neurosurg.* 2016 Oct; 11 (4): 330-42.
35. Avanali R, Bhadran B, Krishna KP, Vijayan A, Arun S, Musthafa AM, et al. Chronic Subdural Hematoma: A Questionnaire Survey of Management Practice in India and Review of Literature. *World Neurosurg.* 2016 Dec; 96: 355-61.
36. Xu C, Chen S, Yuan L, Jing Y. Burr-hole Irrigation with Closed-system Drainage for the Treatment of Chronic Subdural Hematoma: A Meta-analysis. *Neurol Med Chir (Tokyo)*, 2016; 56 (2): 62-8.
37. Wang K, Chen D, Cao X, Gao L. A Prospective Comparative Study of Twist Drill Craniostomy Versus Burr Hole Craniostomy in Patients with Chronic Subdural Hematoma. *Turk Neurosurg.* 2017; 27 (1): 60-5.
38. Pang CH, Lee SE, Kim CH, Kim JE, Kang HS, Park CK, et al. Acute intracranial bleeding and recurrence after burr hole craniostomy for chronic subdural hematoma. *J Neurosurg.* 2015 Jul; 123 (1): 65-74.
39. Kim GH, Kim BT, Im SB, Hwang SC, Jeong JH, Shin DS. Comparison of the Indications and Treatment Results of Burr-Hole Drainage at the Maximal Thickness Area versus Twist-Drill Craniostomy at the Pre-Coronal Point for the Evacuation of Symptomatic Chronic Subdural Hematomas. *J Korean Neurosurg Soc.* 2014 Sep; 56 (3): 243-7.
40. Kutty SA, Johny M. Chronic subdural hematoma: a comparison of recurrence rates following burr-hole craniostomy with and without drains. *Turk Neurosurg.* 2014; 24 (4): 494-7.

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