



# Chronic Subdural Hematoma: A Comparison of Recurrence Rates Following Burr-Hole Craniostomy with and without Drains

## *Kronik Subdural Hematom: Drenle veya Drensiz Burr Delikli Kraniostomi Sonrasında Nüks Oranlarının Karşılaştırılması*

Shankar Ayyappan KUTTY, Mishal JOHNY

*Malabar Institute of Medical Sciences, Department of Neurological Sciences, Kozhikode, Kerala, India*

Corresponding Author: Shankar Ayyappan KUTTY / E-mail: thinavila@yahoo.com

### ABSTRACT

**AIM:** To compare the rates of recurrence of chronic subdural hematoma following surgical evacuation by one of two methods, namely, using frontal and parietal burr holes without a drain or a single parietal burr hole with the addition of a subdural drain.

**MATERIAL and METHODS:** This was a randomized controlled trial with two groups of 70 patients each. Patients in group I had two burr holes and those in group II had a single burr-hole. A subdural drain was placed for the second group, and this was removed 48-72 hours later. Patients were followed up for 3 months and symptomatic recurrences underwent re-exploration.

**RESULTS:** 11 out of 70 patients in group I had recurrent hematomas requiring surgery while only two out of 70 patients in group II had symptomatic recurrences. The difference was statistically significant ( $p=0.0168$ ).

**CONCLUSION:** The use of a single burr hole with drain appears to be a safe and effective procedure for the treatment of chronic subdural hematoma.

**KEYWORDS:** Chronic, Subdural hematoma, Burr-hole, Drain, Compare, Recurrence

### ÖZ

**AMAÇ:** Bir dren olmadan frontal ve parietal burr delikleri veya bir subdural dren eklenmesiyle tek bir parietal burr deliği şeklinde iki yöntemden biriyle cerrahi boşaltma sonrasında kronik subdural hematomun nüks oranlarını karşılaştırmak.

**YÖNTEM ve GEREÇLER:** Bu, her grupta 70 hasta bulunan iki grupta yapılan randomize bir kontrollü çalışmaydı. Grup I'deki hastalarda iki burr deliği ve grup II hastalarında tek burr deliği kullanıldı. İkinci grup için bir subdural dren yerleştirildi ve 48-72 saat sonra çıkarıldı. Hastalar 3 ay boyunca takip edildi ve semptomatik nükslerde tekrar keşif yapıldı.

**BULGULAR:** Grup I'deki 70 hastanın 11'inde cerrahi gerektiren nüks hematom gelişirken grup II'deki 70 hastanın sadece ikisinde semptomatik nüks görüldü. Fark istatistiksel olarak önemliydi ( $p=0,0168$ ).

**SONUÇ:** Tek burr deliğinin drenle kullanımı kronik subdural hematom tedavisinde güvenli ve etkin bir işlem olarak gözükmetedir.

**ANAHTAR SÖZCÜKLER:** Kronik, Subdural hematom, Burr deliği, Dren, Karşılaştırma, Nüks

### INTRODUCTION

Chronic subdural hematomas are one of the most common conditions encountered in general neurosurgical practice. However, there has been little clarity on the optimal management of this condition in literature. In fact, till recently, the question of whether these lesions needed surgery was also controversial. Various authors had suggested burr hole drainage or limited craniectomies, with adjuvant techniques such as the use of drains and irrigation of the subdural space intra-operatively or continuously during the post-operative period. Most of the modifications were aimed at reducing the complications of subdural hematoma, especially recurrence and pneumocephalus. However, there was no clear evidence

of the superiority of any one technique over the other, till Santarius et al. (16) published a randomized controlled trial comparing the recurrence rates when drains were used, against recurrence rates in patients in whom no drains were used during evacuation of SDH.

### METHODS

This was a randomized control trial of surgeries done by a single surgeon at a single centre from May 2005 to April 2011. During this period, all patients were treated with frontal and parietal burr holes on the side of the hematoma (group I) or a single parietal burr hole with a subdural drain (group II). After the hematoma was evacuated, the subdural space was flushed with saline. In group I patients, the parietal burr-hole

was then closed and the subdural space filled with saline prior to closing the frontal burr hole.

In group II patients, the surgical technique was modified so that only a single parietal (or dependent) burr-hole was made. A sterile No. 8 infant feeding tube was inserted into the subdural space, provided it was patent and the brain had not expanded to fill this space. Any residual hematoma was then aspirated gently using a 20 cc syringe. Aspiration was stopped immediately if there was any obstruction to free flow of blood, or if air bubbles started to enter the syringe, indicating that the hematoma was almost completely evacuated. The subdural space was flushed with saline and the returns were also aspirated out using the syringe, till the returns were clear. The space was then filled with saline till the level of the burr hole and a sterile catheter was inserted into the subdural space, which was then brought out through a separate stab incision and connected to a closed drainage system. Before closing the wound, gentle aspiration was given to the catheter to ascertain free flow of the subdural fluid. If the flow was not free, it was repositioned, with the tip going posteriorly. In the post-operative period, the drain was kept in situ till the drainage became negligible, which usually happened in 48-72 hours.

During the initial period of the study, ventricular catheters from external ventricular drainage (EVD) sets were used as subdural drains, but these tended to get blocked by the thick blood and blood clots. It was therefore decided to use sterile No. 8 infant feeding tubes as the drains, and these were connected to the EVD bags using a three way connector.

#### **Inclusion Criteria**

All patients with radiologically proven chronic subdural hematoma, who had undergone burr hole evacuation for the same, between May 2005 and April 2011.

Exclusion criteria

1. Age less than 18 years
2. Oral anticoagulant use (warfarin)
3. Patients with bleeding diathesis

The patients who qualified for the study were divided into two groups using a randomization chart. No matching was done for age or sex. All patients were followed up at 1 week, 1 month and 3 months after surgery and repeat imaging was done if they developed a recurrence of their original symptoms, or new symptoms suggestive of raised intracranial pressure. Routine post operative imaging was not employed for the study as it was not a part of departmental protocol.

**Table I:** Patients' Characteristics

Group	No of patients	Male: Female	Bilateral	Antiplatelets	Recurrence
I (No drain)	70	58:12	11	17	11
II (With drain)	70	55:15	17	25	2

## **RESULTS**

A total of 148 patients underwent burr-hole evacuation of chronic subdural hematoma during the study period. Of these, 8 patients were excluded (two were in the paediatric age group, 4 were on anticoagulants and 2 had cirrhosis with thrombocytopenia), leaving a total of 140 patients. These patients were between 32 and 98 years of age, with a mean age of 64.86 years and a median of 66 years. There were one hundred and thirteen males and twenty seven females. Group I (burr hole without drain) constituted of 58 males and 12 females while Group II (burr hole with drain) had 55 males and 15 females (Table I). Twenty eight of these patients had bilateral hematomas (11 in Group I and 17 in group II).

Eleven patients in group I had symptomatic recurrence requiring re-operation. In all cases, the burr hole was reopened and a procedure similar to that adopted for the second group was carried out, with no further recurrences. Two of these patients had bilateral lesions initially. In one, the recurrence was also bilateral, while it was unilateral in the second.

Two patients in Group II had recurrences, one of which was in a patient who had undergone bilateral surgery initially and developed a unilateral recurrence. Both responded to a repeat procedure. Six of the recurrences in Group I and both cases in Group II occurred in patients who had been on aspirin, clopidogrel or a combination of both. In four of these cases the drug had been discontinued 5 days prior to surgery, but had to be restarted within a month due to high cardiovascular risk. The other four patients had been operated on an emergency basis while on anti-platelet drugs, which were then discontinued for as long as was considered safe by the Cardiologist, the average period being one month (range 15 days to 2 months).

The statistical significance of the outcomes was measured using Fishers exact test and a two tailed p value of 0.0168 was obtained, which was highly significant.

None of our patients were on prophylactic anticonvulsants, and only two patients developed seizures in the post operative period. There was only one death in this series, and this was a patient with chronic renal failure, who had partly calcified, recurrent hematomas.

## **DISCUSSION**

Chronic subdural hematoma (CSDH) was first described by J J Wepfer in 1658 (7) and found its way into popular literature in the novel "Pierette" by Honore de Balzac in 1840 (20). Balzac described the traumatic origin and surgical treatment of these hematomas at a time when the disease was not recognised as a separate clinical entity by the medical fraternity.

This view was contested by Virchow, who in 1857 coined the term "pachymeningitis hemorrhagica interna" to describe this disease, which he attributed to inflammatory processes. It was only in 1914 that the traumatic origin of these hematomas was firmly established by Trotter. Hulke described the first successful surgical treatment of chronic subdural hematoma in 1883 (21).

Though CSDH is one of the commonest diagnoses entertained by general neurosurgical practices around the world, its optimal treatment remains shrouded in mystery (15). Most Neurosurgeons and Neurologists now prefer surgical treatment for patients who are very symptomatic and conservative therapy is reserved for those with mild symptoms (1, 3).

The procedure of choice is also been open to question, with reports of craniotomy, mini craniotomy, burr hole with or without drains, twist drill craniostomy, subgaleal drains (5,6) and trans-marrow puncture (10) being found in the literature. Questions were also raised about the number of burr holes (one or two) to be made, but no difference in recurrence was reported in studies comparing the two techniques (9,11) except by Taussky et al. who found a significant increase in recurrence rates when only a single burr hole was used (19).

White et al. did not find a significant difference in outcome with either a mini-craniotomy or burr hole and drainage of CSDH (23). A meta-analysis by Weigel et al. (22) found no significant difference in mortality when three modalities, namely twist drill craniostomy (diameter <5 mm), burr hole (5-30 mm) or craniotomy were used as the treatment modality. However, Williams et al. (24) reported a higher recurrence rate with twist drill craniostomy while no significant difference was noted by Gökmen et al. (6). Overall, it can probably be stated that current evidence does not favour any particular surgery with regard to clinical outcome and hence the choice of surgery would rest with the clinician.

The second confounding factor, when burr holes have been made to treat chronic subdural hematoma, has been the number of burr holes required to drain a hematoma. A retrospective review of 167 patients by Ohba et al. (12) had identified the presence of a large pneumocephalus as a predictor for recurrence. Logically, using parietal and frontal burr holes, and filling the subdural space with saline through the latter, would help to reduce the occurrence of pneumocephalus and its complications. There has been no significant study which compared this technique with the use of a single burr hole with drains, the utility of which was established in a randomised control trial published by Santarius et al. This study compared the recurrence rate of CSDH following surgical evacuation via a single burr hole, with and without drains and found a significant reduction in recurrence rates when drains were used (16).

Prior to the current study all patients in our institute were treated with parietal and frontal burr holes. After a number of patients, especially those on anti platelet drugs, developed

recurrent hematomas, requiring re-exploration, it was decided to study whether inserting a subdural drain prior to closing the wound would have any effect on the recurrence rate. The rationale was the low incidence of recurrence when a drain was used in those patients undergoing re-exploration after a twin burr-hole surgery. Once drains were used, filling the subdural space with saline appeared superfluous, as the fluid would drain out almost immediately on opening the drain. It was felt that pneumocephalus, if present, would also be drained out as the brain started to expand, and hence a single burr hole was used from that point of time.

The first case in this study was recruited in May 2005, when the principal surgeon had already completed 3 years of surgical practice after residency training, and hence it is unlikely that there is any bias due to a learning curve. Furthermore, inter-personal variability is absent in this series as all the cases were operated by the same surgeon.

Patients in this series were not given either anticonvulsants or steroids on a routine basis. Only two of our patients had post operative seizures, which were generalised in nature and could be easily controlled with a single anticonvulsant. Ramachandran & Hegde (13) found that a sub cohort of patients with CSDH may benefit from the use of anti-epileptic therapy, but there is no evidence for the routine use of anti-epileptics in patients with chronic subdural hematoma.

Berghauer et al. (2) reviewed the influence of corticosteroid therapy on the recurrence rates and found five observational studies that reported a reduction in recurrence rates with the use of steroids (4, 18). However, level I evidence was lacking with regard to the beneficial effects of steroids. As our study has shown that the recurrence rates with a meticulous technique may be less than 3%, the need for routine use of corticosteroids, with its attendant deleterious effects, have to be studied further before a recommendation can be made on the need to use steroids in these patients.

Many of our patients who developed hematomas and most of those with recurrences were on anti platelet drugs prior to surgery. This finding correlates well with literature, where risk factors for the development of CSDH and its recurrence have included the use of anti-platelet and anti-coagulant drugs (17). Most of the patients had been started on medications prophylactically, as they had long standing hypertension or diabetes mellitus. The use of routine antiplatelet prophylaxis for low risk patients with diabetes mellitus and hypertension needs to be critically reviewed in this setting.

Our study had a significant male preponderance, a fact that was also noted previously by Kanat et al. (8). The increased risk of cardiac diseases among the male population leading to increased anti platelet use, associated with the increased risk of occupational trauma may be the reason behind this finding. Mortality in our series was minimal, but high rates have been reported in literature, with part of the mortality being due to associated medical complications such as pneumonia (14).

In conclusion, the routine use of drains inserted into the subdural space following burr hole evacuation of chronic subdural hematoma appears to be associated with a significant reduction in the recurrence rate of this disease without any increase in morbidity and we would recommend that this be adopted as a standard practice everywhere. Meticulous clearing of subdural blood by flushing the space thoroughly and maintaining the drain in situ till the drainage becomes minimal, may further improve the outcome.

#### REFERENCES

- Berghauer Pont LM, Dippel DW, Verweij BH, Dirven CM, Dammers R: Ambivalence among neurologists and neurosurgeons on the treatment of chronic subdural hematoma: A national survey. *Acta Neurologica Belgica* 113: 55-59, 2013
- Berghauer Pont LM, Dirven CM, Dippel DW, Verweij BH, Dammers R: The role of corticosteroids in the management of chronic subdural hematoma: A systematic review. *Eur J Neurol* 19(11):1397-1403, 2012
- Cenic A, Bhandari M, Reddy K: Management of chronic subdural hematoma: A national survey and literature review. *Can J Neurol Sci* 32(4): 501-506, 2005
- Delgado-López PD, Martín-Velasco V, Castilla-Díez JM, Rodríguez-Salazar A, Galacho-Harriero AM, Fernández-Arconada O: Dexamethasone treatment in chronic subdural haematoma. *Neurocirugía (Astur)* 20(4):346-359, 2009
- Gazzeri R, Galarza M, Neroni M, Canova A, Refice GM, Esposito S: Continuous subgaleal suction drainage for the treatment of chronic subdural haematoma. *Acta Neurochir (Wien)* 149(5): 487-493, 2007
- Gokmen M, Sucu HK, Ergin A, Gokmen A, Bezircio Lu H: Randomized comparative study of burr-hole craniostomy versus twist drill craniostomy; surgical management of unilateral hemispheric chronic subdural hematomas. *Zentralbl Neurochir* 69(3):129-133, 2008
- Guénot M: Chronic subdural hematoma: Historical studies *Neurochirurgie* 47(5): 461-463, 2001
- Kanat A, Kayaci S, Yazar U, Kazdal H, Terzi Y: Chronic subdural hematoma in adults: Why does it occur more often in males than females? Influence of patient's sexual gender on occurrence. *J Neurosurg Sci* 54(3): 99-103, 2010
- Kansal R, Nadkarn T, Goel A: Single versus double burr hole drainage of chronic subdural hematomas. A study of 267 cases. *J Clin Neuroscience* 17(4):428-429, 2010
- Latini MF, Fiore CA, Romano LM, Spadaro E, Zorrilla JP, Gonorazky SE, Gaspari M, Villegas JA: Minimally invasive treatment of chronic subdural hematoma in adults. Results in 116 patients. *Neurologia* 27(1): 22-27, 2012
- Lee JK, Choi JH, Kim CH, Lee HK, Moon JG: Chronic subdural hematomas: A comparative study of three types of operative procedures. *J Korean Neurosurg Soc* 46(3): 210-214, 2009
- Ohba S, Kinoshita Y, Nakagawa T, Murakami H: The risk factors for recurrence of chronic subdural hematoma. *Neurosurgical Review* 36(1):145-150, 2013
- Ramachandran R, Hegde T: Chronic subdural hematomas—causes of morbidity and mortality. *Surg Neurol* 67(4): 367-372, 2007
- Rohde V, Graf G, Hassler W: Complications of burr-hole craniostomy and closed-system drainage for chronic subdural hematomas: A retrospective analysis of 376 patients. *Neurosurg Rev* 25: 89-94, 2002
- Santarius T, Hutchinson PJ: Chronic subdural haematoma: Time to rationalize treatment? *Br J Neurosurg* 18(4):328-332, 2004
- Santarius T1, Kirkpatrick PJ, Ganesan D, Chia HL, Jalloh I, Smielewski P, Richards HK, Marcus H, Parker RA, Price SJ, Kirillos RW, Pickard JD, Hutchinson PJ: Use of drains versus no drains after burr-hole evacuation of chronic subdural haematoma: A randomised controlled trial. *Lancet* 374: 1067-1073, 2009
- Sim YW, Min KS, Lee MS, Kim YG, Kim DH: Recent changes in risk factors of chronic subdural hematoma. *J Korean Neurosurg Soc* 52(3):234-239, 2012
- Sun TF, Boet R, Poon WS: Non-surgical primary treatment of chronic subdural haematoma: Preliminary results of using dexamethasone. *Br J Neurosurg* 19(4): 327-333, 2005
- Taussky P, Fandino J, Landolt H: Number of burr holes as independent predictor of postoperative recurrence in chronic subdural haematoma. *Br J Neurosurg* 22(2): 279-282, 2008
- van den Doel EM: Balzac's 'Pierrette'. An early description of chronic subdural hematoma. *Arch Neurol* 43(12):1291-1292, 1986
- Weigel R, Krauss JK, Schmiedek P: Concepts of neurosurgical management of chronic subdural haematoma: Historical perspectives. *Br J Neurosurg* 18(1):8-18, 2004
- Weigel R, Schmiedek P, Krauss JK: Outcome of contemporary surgery for chronic subdural haematoma: Evidence based review. *J Neurol Neurosurg Psychiatry* 74(7): 937-943, 2003
- 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* 24(3): 257-260, 2010
- Williams GR, Baskaya MK, Menendez J, Polin R, Willis B, Nanda A: Burr-hole versus twist-drill drainage for the evacuation of chronic subdural haematoma: A comparison of clinical results. *J Clin Neurosci* 8(6): 551-554, 2001