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Comparative Study of Efficacy and Safety of Mini-craniotomy under Local Anaesthesia versus General Anaesthesia for Chronic Subdural Hematoma

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ABSTRACT

Background: Mini-craniotomy is generally better than burr whole drainage for chronic subdural hematoma (CSDH) as there are less chances of recurrence and need for re-surgery in this technique. But generally mini craniotomy is performed under general anaesthesia and this is found to be associated with post-operative complication in earlier studies. The same procedure when carried under local anaesthesia is expected to cause less post-operative complications.
Aim: To compare the efficacy and safety of min-craniotomy under general anaesthesia and local anaesthesia for CSDH.
Material & Methods: It was a retrospective study in which patients of age 50 years or higher that have undergone mini-craniotomy under general or local anaesthesia were included. Pre-operative condition, surgery duration and post-operative complications were taken from patient's medical records and compared.
Results: Sixty patients were included in the study. Thirty-two of these patients underwent mini-craniotomy under LA and thirty-eight under GA. Improvement was better in patients who underwent the surgery under local anaesthesia than the general anaesthesia group. Post-operative complications like pneumonia and DVT (Deep Venous Thrombosis) were less frequent in local anaesthesia group.
Conclusion: Mini-craniotomy performed under local anaesthesia is found to have same efficacy than the same procedure performed under general anaesthesia. It is also found to have less chance of recurrence, reoperation and postoperative complication. So, mini-craniotomy under local anaesthesia can be better alternative for CSDH.

Keywords: Mini-craniotomy, Local anaesthesia, General anaesthesia, chronic subdural hematoma

INTRODUCTION

The prevalence status of chronic subdural hematoma (CSDH) is approximately 3 out of 100,000, with significant increases noted in the elderly.[1]

Clinical presentation may range from no symptoms to fainting. CSDH is usually detected by CECT (Contrast Enhanced Computed Tomography). Magnetic resonance imaging (MRI) scans are critical to detect bilateral isodense CSDH, multiple loculations, intra-hematoma membranes, new bleeding, haemolysis, and capsule size. Differential CT or MRI scans can detect the underlying primary or metastatic diseases. Although a clear history of trauma can be found in most cases, other cases may be due to coagulation disorder, intracranial hypotension, anti-platelet or anti-coagulant drugs, etc. Entrapment of CSF, exudates from outer

membrane and recurrent bleeding can also contribute to the expansion of CSDH.

Although there is little doubt that surgical interventions for symptomatic patients are beneficial, much of the controversy revolves around choosing the right surgical procedure. [2] Despite the fact that CSDH drainage is a routine procedure, we do not have first-line evidence compared to the various surgical methods. A retrospective review of sequential mini-craniotomy procedures for subdural hematoma patients by Van Der Veken et al. [3] highlighted the technical height of the process compared to the burr-hole method. But Recent articles favour the burr hole method over the twist-drill craniotomy.[1] One of the main reasons for this choice is the relief that can be performed under both local anaesthesia (LA) and general anaesthesia (GA) and the accompanying low-grade illness. In contrast to studies in burr whole method, there is a lack of documentation focusing on mini-craniotomy.

In a systematic review conducted by Lega et al., 4 of the 3 studies describing management of SDH mini-craniotomy were discussed.[4-7] Their study compares 6222 cases of burr-hole method with only 361 cases of craniotomies, and they didn't compared craniotomies under GA and under LA.[4]

In a world where neuro critical care facilities and respiratory beds are limited, it is very important to find ways to help reduce the need for ventilation after surgery. Faced with the problem of limited number of respiratory beds, we recently modified the mini-craniotomy procedure under LA, which claims to carry the many benefits of burr hole (avoiding GA) and mini-craniotomy (minimal recurrence rates). Considering the differences in the mini-craniotomy under LA and other surgical methods of subdural hematoma, we decided to review our data.

The aim of this study was to compare the mini-craniotomy of CSDH under LA compared with the same procedure performed under GA, in terms of duration, residual frequency or recurrence requiring second surgery, length of intensive care unit (ICU), and length of hospital stay.

MATERIALS & METHODS

This was a retrospective study done at department of anaesthesia of tertiary care hospital of northern India from September 2020to September 2021. All consecutive cases with age greater than 55 years, performed by same surgeons were included in this study. Patients with missing data were not included. No sampling was done. Patients were given freedom to choose the type of surgery they want after proper discussion with anesthetist. The study was approved by the Institutional Ethics Committee (IEC) and IEC waiver of consent was obtained due to retrospective nature of the study.

Procedure

This surgery is done keeping the patient in supine position. A dedicated anaesthetist is assigned to the patient to carry out essential precautions. Active antibiotics are given to cover gram-positive bacteria, and beta blockers are readily available in case blood pressure is above 160 systolic. First, 1-2 mg of midazolam is given by intravenous route. The patient's head is placed in a ring, and a neutral position is maintained carefully. After shaving a part of patient's head, a linear incision is marked matching the size of maximum thickness of subdural hematoma and 2% lidocaine without epinephrine is infiltrated. A 3x3 cm craniotomy is performed with only one burr hole. The dura is opened in the form of a crucifix, and the margins are cauterized. All hematoma membranes are opened under vision taking the help of loupes. Thereafter subdural space is to be irrigated. The bone is attached to the plates, and a subgaleal drain is placed after the surgery.

Data Collection

Medical records of eligible patients were obtained from the IPD files after the

approval of the institutional ethics committee. Data were collected with the help of pro forma. The pro forma had sections on baseline demographic characteristics and clinical features that included symptoms, details of surgery and post-surgical conditions. Data collected included condition at surgery, type of anaesthesia, duration of operation, surgical procedure, blood loss, and type of irrigation. Duration of time spent with drain, duration of stay in the ICU or specialized care were also recorded. We also recorded postoperative improvements in the neurologic condition, based on pre- and post-surgical diagnostic tests, speech defect or hemiparesis. CT scan findings were recorded if it was done. Coding was done to patients records and the assessor and data analyst was blinded.

Statistical Analysis

Descriptive analysis was used in interpreting the results by using Microsoft Excel. Categorical data was expressed in proportion and percentage and continuous data was expressed as mean and standard deviation (SD). As per Q-Q plot of the data and applying Shapiro Wilk test, the data were found to be normally distributed. Therefore, unpaired t test was done for comparing mean pre-operative GCS score, mean surgery time and mean follow-up period whereas chi-square test was done for comparing known surgical factors and outcome/complications. Significance level for these tests was determined as 95% ($P<0.05$).

RESULTS

Sixty patients were included in the study. Thirty-two of these patients underwent mini-craniotomy under LA and thirty-eight under GA. Most patients presented with headaches, with or without other symptoms indicating mass effect. Other common presentations found were drowsiness, hemiparesis, or confusion. Baseline demographic and clinical characteristic are given in table 1.

Mean duration of surgery was 67.26 in group of patients who underwent mini-craniotomy under local anaesthesia whereas it was 98.98 minutes in group of patients who underwent mini-craniotomy under general anaesthesia.

Table 1: Baseline Demographic and Clinical Characteristics of Patients

Variables	Mini Craniotomy Under Local Anesthesia	Mini Craniotomy Under General Anesthesia	P -Value
Total Number of Patients	32	38	
Number of Male (%)	20 (62.5)	30 (78.95)	1.00* NS
Number of Female (%)	12 (37.5)	18 (47.37)	
Age (Mean ± SD in years)	65.66± 10.32	68.85± 9.87	0.19** NS
Number of Smokers (%)	4 (12.5)	4 (10.53)	0.80* NS
Number of Patients having Diabetes Mellitus (%)	14 (43.75)	12 (31.58)	0.294* NS
Number of Hypertensive Patients (%)	24 (75)	32 (84.21)	0.34* NS
Number of Patients having Coronary Artery Disease (%)	2 (6.25)	4 (10.53)	0.524* NS
Number of Patients having Bilateral Subdural Hematoma (%)	4 (12.5)	4 (10.53)	0.80* NS
Number of Patients having Neurological Deficit (%)	14 (43.75)	12 (31.58)	0.294* NS
Number of Patients with Headache (%)	6 (18.75)	12 (31.58)	0.22* NS
Number of Patients with Drowsiness (%)	8 (25)	14 (36.84)	0.16* NS
Glasgow Coma Scale (Mean ± SD)	15.29 ± 2.13	14.32 ± 2.37	0.06** NS
Surgery Time in minutes (Mean ± SD)	67.26± 10.33	98.98± 16.55	0.0001** S

***Chi Square Test ** Unpaired t test S- Significant NS – Non-Significant**

Table 2: Comparison between Known Surgical Factors between two groups:

Outcome/Complicatns	Mini-Craniotomy under Local Anaesthesia (n=32)	Mini-Craniotomy under General Anaesthesia (n=38)	P Value Chi Square Test
Type of CSDH			
Subacute CSDH	10	13	0.97 NS
Acute on CSH	8	9	
Other	14	16	
Etiology			
Tuberculosis related	7	11	0.50 NS
Spontaneous	21	25	
Unknown	4	2	
Fenestration of Inner Membrane			
Yes	29	33	0.62 NS
No	3	5	
Type of Anticoagulants			
Apixaban	2	1	0.50 NS
Warfarin	3	7	
Anti-platelets	12	15	

S- Significant NS – Non-Significant

Table 3: Comparison of outcomes and complications of Mini-Craniotomy for Chronic Subdural Hematoma

Outcome/Complications	Mini-Craniotomy under Local Anaesthesia (n=32)	Mini-Craniotomy under General Anaesthesia (n=38)	P Value
Mean follow up period in months (Mean ± SD)	3.67 ± 0.98	5.32 ± 1.12	<0.0001** S
Number of Patients showing improvement (%)	30 (93.75)	31 (81.58)	0.13* NS
Recurrence (%)	1 (3.13)	3 (7.89)	0.39* NS
Requirement for second surgery (%)	1 (3.13)	2 (5.26)	0.66* NS
Death (%)	3 (9.38)	5 (13.16)	0.62* NS
Pneumonia after surgery (%)	1 (3.31)	4 (10.53)	0.23* NS
Urinary Tract infection (%)	1 (3.13)	3 (7.89	0.39* NS
DVT -Deep Vein Thrombosis (%)	1 (3.13)	4 (10.53)	0.23* NS
Need for ICU (%)	1 (3.13)	10 (26.32)	0.008* S

***Chi Square Test ** Unpaired t test S- Significant NS – Non-Significant**

Improvement was better in patients who underwent the surgery under local anaesthesia than the general anaesthesia group. There was no case of post-surgical pneumonia in the local anaesthesia group. As duration was hospital stay was low in patients of local anaesthesia group, incidence of DVT (Deep Vein Thrombosis) was also low.

DISCUSSION

Chronic Sub-Dural Hematoma (CSDH) is among the most common neurosurgical conditions. Age is most important risk factor for this neurological problem as prevalence is greater in geriatric population. [8-10] Recent epidemiological studies have found the incidence of CSDH in people of age group 71-80 to be around 20.6 per 1000,000/ year. [11-12] Multiple co-morbidities such as hypertension and diabetes also complicate the scenario in this population. Most of the patients are also suffering from ischemic heart disease and are on anti-platelet drugs. [3] Thus, in patients of old age developing CSDH; chances of requirement of ICU care are high. But, number of beds in ICU is limited.

Burr-hole drainage of subdural hematoma under local anaesthesia has been one the commonly used treatment option. [13] Many studies have been done on it but chances of recurrence are also high after this procedure. [3,14] Mini-craniotomy has been proved better than burr-hole drainage from earlier studies. [3]

Early outcome of the procedure of mini-craniotomy under local anaesthesia have been described in our article. By this procedure, we can avoid general anaesthesia

as in burr-hole technique and also decreases the chances of recurrences or residual hematoma. [3] It was also estimated to reduce duration of surgery and duration of hospital stay with less chance of requirement of ICU and ventilator care.

There was no significant difference between two groups with respect to pre-existing complications or chronic disease, type of CSDH, etiology and type of anticoagulants used.

Our assumption was well proved in this study. Post-operative complications were less frequent in local anaesthesia group than in general anaesthesia group. Mean follow up period was significantly lower in local anaesthesia group. Incidence of post-operative pneumonia and DVT were greater in general anaesthesia group. Recurrence rate and requirement for second surgery was also lower in local anaesthesia group but the differences were not significant. ICU care was given to only one patient in local anaesthesia group whereas 10 patients of general anaesthesia group needed ICU care.

In earlier studies, rate of recurrence in local anaesthesia group was much lower (3.13%) in patients undergoing mini-craniotomy under LA than in burr hole technique (4.6-16%). [15-18] other surgical complications were also reported to be high (14.6%) in burr hole technique according to earlier studies. [19]

Long-term sequelae of CSDH are can cause significant morbidity. Numerous studies have shown a combination of cognitive decline and cerebral atrophy with CSDH. [20,21,22] Apparently, the critical response to brain inflammation in the initial episode of CSDH is elicited and persist.[23, 24] Recent trials have focused on reducing this response with dexamethasone or atorvastatin.[25] There has also been a recent interest in the embolization of meningeal artery (MMA) as a treatment for CSDH. Recent studies have shown its effectiveness in reducing the size of CSDH after previous treatment.[26] The advantage of this technique is less invasive nature which is preferred in old and morbid patients.

The presence of CSDH may interfere with the normal flow of interstitial fluid of the brain due to its local mass effect. There has been a recent interest in the importance of this fluid flow through the brain with g-lymphatics and dural lymphatics.[27] If there is no fenestration of inner membrane, this too will act as a barrier to the brain that can continue to affect the flow of g-lymphatics. Finally, if the brain cannot expand and if the pia-arachnoid does not interact with the lymphatics of dura, this can alter the turnover of CSF.[28] There is growing evidence that g-lymphatic and dural lymphatic systems are important in removing potent neurodegenerative toxins such as Tau and Amyloid beta in the brain.[29] Pathology in their drainage and clearance other proteins are set to play a role in the pathophysiology of dementia. Additional studies on the relationship between CSDH and long-term outcomes and type of surgery or procedure performed will help us better plan the process to maximize long-term neurological outcomes.

The aim of this study was to generate data that would promote the practice of mini-craniotomy under local anaesthesia for chronic subdural hematoma. However, the study was done retrospectively on small number of patients. This study does highlight the need of some multi-centre prospective study that could strengthen our evidence. Pre-operative GCS score has significant impact on post-operative outcomes and pre-operative GCS score was better in local anaesthesia group but the difference was not so much significant. Surgeons and anaesthetist tend to be more caution in case of morbid patients in implementing new techniques and this was probably the reason for the difference.

CONCLUSION

In resource limited area, procedures and plan that will decrease the need of ICU and ventilator care should be adopted. Such procedures are also vital for elderly patients.

From this study, it was found that there was less need for ICU care after mini-craniotomy under local anaesthesia than under general anaesthesia. The patient whose craniotomy was done under local anaesthesia have less surgery time and less post-operative stay in hospital. After this procedure, there was less recurrence and need for re-surgery. There were less post-operative complications as compared to mini-craniotomy under general anaesthesia. So, mini-craniotomy under local anaesthesia was found to be better alternative than mini-craniotomy under general anaesthesia.

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REFERENCES

1. Regan JM, Worley E, Shelburne C, Pullarkat R, Watson JC. Burr hole washout versus craniotomy for chronic subdural hematoma: patient outcome and cost analysis. PLoS One. 2015; 10:e0115085.
2. Cenic A, Bhandari M, Reddy K. Management of chronic subdural hematoma: a national survey and literature review. Can J Neurol Sci. 2005; 32: 501-506.
3. Van Der Veken J, Duerinck J, Buyl R, Van Rompaey K, Herregodts P, D'Haens J. Minicraniotomy as the primary surgical intervention for the treatment of chronic subdural hematoma—a retrospective analysis. Acta Neurochir. 2014; 156:981-987.
4. Lega BC, Danish SF, Malhotra NR, Sonnad SS, Stein SC. Choosing the best operation for chronic subdural hematoma: a decision analysis. J Neurosurg. 2010; 113:615-621.
5. Kwon TH, Park YK, Lim DJ, Cho TH, Chung YG, Chung HS, et al. Chronic subdural hematoma: evaluation of the clinical significance of postoperative drainage volume. J Neurosurg. 2000;93: 796-799.
6. Miele VJ, Sadrolhefazi A, Bailes JE. Influence of head position on the effectiveness of twist drill craniostomy for chronic subdural hematoma. Surg Neurol. 2005;63:420-423.
7. Tanikawa M, Mase M, Yamada K, Yamashita N, Matsumoto T, Banno T, et al. Surgical treatment of chronic subdural hematoma based on intrahematomal membrane structure on MRI. Acta Neurochir. 2001; 143:613-618.
8. Yang W, Huang J. Chronic subdural hematoma: epidemiology and natural history. Neurosurg Clin N Am. 2017; 28:205-210.
9. 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 [E-pub ahead of print]. J Neurosurg. http://dx.doi.org/10.3171/2016.9.JNS16623, accessed July 9, 2017.
10. Uno M, Toi H, Hirai S. Chronic subdural hematoma in elderly patients: is this disease benign? Neurol Med Chir (Tokyo). http://dx.doi.org/10.2176/ nmc.ra.2016-0337, accessed July 9, 2017.
11. Karibe H, Kameyama M, Kawase M, Hirano T, Kawaguchi T, Tominaga T. Epidemiology of chronic subdural hematomas. No ShinkeiGeka. 2011; 39:1149-1153 [in Japanese].
12. Adhikari NK, Fowler RA, Bhagwanjee S, Rubenfeld GD. Critical care and the global burden of critical illness in adults. Lancet. 2010;376: 1339-1346.
13. Santarius T, Kirkpatrick PJ, Kolias AG, Hutchinson PJ. Working toward rational and evidence-based treatment of chronic subdural hematoma. Clin Neurosurg. 2009;57: 112-122.
14. Sambasivan M. An overview of chronic subdural hematoma: experience with 2300 cases. Surg Neurol. 1997; 47:418-422.
15. Khadka NK, Sharma GR, Roka YB, Kumar P, Bista P, Adhikari D, et al. Single burr hole drainage for chronic subdural haematoma. Nepal Med Coll J. 2008;10: 254-257
16. Kuroki T, Katsume M, Harada N, Yamazaki T, Aoki K, Takasu N. Strict closed-system drainage for treating chronic subdural haematoma. Acta Neurochir. 2001; 143:1041-1044.

17. Matsumoto K, Akagi K, Abekura M, Ryujin H, Ohkawa M, Iwasa N, et al. Recurrence factors for chronic subdural hematomas after burr-hole craniostomy and closed system drainage. Neurol Res. 1999; 21:277-280.
18. Sarnvivad P, Chiewchanvechakul W, Chumnanvej S. Chronic subdural hematoma: drainage vs. no drainage. J Med Assoc Thai. 2011;94: 1352-1356.
19. Weigel R, Krauss J, Schmiedek P. Concepts of neurosurgical management of chronic subdural haematoma: historical perspectives. Br J Neurosurg. 2004;18:8-18.
20. Rauhala M, Helen P, Seppa K, Huhtala H, Iverson GL, Niskakangas T, et al. Long-term excess mortality after chronic subdural hematoma. Acta Neurochir (Wien). (2020) 162:1467–78. doi: 10.1007/s00701-020-04278-w
21. Bin Zahid A, Balser D, Thomas R, Mahan MY, Hubbard ME, Samadani U. Increase in brain atrophy after subdural hematoma to rates greater than associated with dementia. J Neurosurg. (2018) 129:1579–87. doi: 10.3171/2017.8.JNS17477
22. Moffatt CE, Hennessy MJ, Marshman LAG, Manickam A. Long-term health outcomes in survivors after chronic subdural haematoma. J Clin Neurosci. (2019) 66:133–7. doi: 10.1016/j.jocn.2019.04.039
23. Jarrott B, Williams SJ. Chronic brain inflammation: the neurochemical basis for drugs to reduce inflammation. Neurochem Res. (2016) 41:523–33. doi: 10.1007/s11064-015-1661-7
24. Edlmann E, Giorgi-Coll S, Whitfield PC, Carpenter KLH, Hutchinson PJ. Pathophysiology of chronic subdural haematoma: inflammation, angiogenesis and implications for pharmacotherapy. J Neuroinflammation. (2017) 14:108. doi: 10.1186/s12974-017-0881-y
25. Allison A, Edlmann E, Kolias AG, Davis-Wilkie C, Mee H, Thelin EP, et al. Statistical analysis plan for the Dex-CSDH trial: a randomised, double-blind, placebo-controlled trial of a 2-week course of dexamethasone for adult patients with a symptomatic chronic subdural haematoma. Trials. (2019) 20:698. doi: 10.1186/s13063-019-3866-6
26. Link TW, Boddu S, Paine SM, Kamel H, Knopman J. Middle meningeal artery embolization for chronic subdural hematoma: a series of 60 cases. Neurosurgery. (2019) 85:801–7. doi: 10.1093/neuros/nyy521
27. Iliff JJ, Goldman SA, Nedergaard M. Implications of the discovery of brain lymphatic pathways. Lancet Neurol. (2015) 14:977–9. doi: 10.1016/S1474-4422(15)00221-5
28. Tamura R, Yoshida K, Toda M. Current understanding of lymphatic vessels in the central nervous system. Neurosurg Rev. (2020) 43:1055–64. doi: 10.1007/s10143-019-01133-0

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