Original Article

Effects of Total Intravenous Anaesthesia with Propofol in Patients Undergoing Burr Hole Drainage for Chronic Subdural Haematoma: A Prospective, Randomized, Controlled Clinical Trial

Arefin MS[1], Asfia KN[2], Rahim A[3], AZM Saifuddin[4], Islam MM[5], Chowdhury MMR[6], Islam MI[7], Islam SA[8], Rahman MS[9]

Abstract:

Background: *Burr hole drainage for chronic subdural haematoma is a common neurosurgical treatment. Traditionally which were done under local anaesthesia with sedation. The primary aim of this prospective study was to assess the effects of Total intravenous anaesthesia with Propofol forBurr hole drainage of chronic subdural haematoma.*

Method: *Sixty adults patients age group ranging from 20-80 years without gender discrimination scheduled for Burr hole drainage of chronic subdural haematoma were enrolled in this study. The patients were randomized into two groups. Group A received Inj. propofol I/V @ 1mg/kg over 10 min followed by 25-50 µg/kg/ min infusion. Group B received Inj. Midazolam0.05mg/kg I/V followed by normal saline infusion at 0.2 ml/ kg/hr infusion. Perioperative GCS Score, Heart Rate (HR), mean arterial pressure (MAP), SpO_2, Ramsay sedation score (RSS), complications, rescue drugs requirements are recorded and compared at specific time.*

Results: *The MAP and HR was monitored throughout the perioperative period in both groups and they were more in Group B than Group A in most time intervals and was statistically significant. The Ramsay sedation score (RSS) was significantly lower in Group B patients when compared with Group A.Perioperative requirements of rescue drugs and complications like nausea, vomiting (11.7%) and shivering (13.3%) consecutively were more in group B than in group A and it was statistically significant.*

Conclusion: *This study suggests that Total intravenous anaesthesia with propofol is safe & effective technique alone for Burr hole drainage of CSDH than local anaesthesia with sedation. It also facilitates patient comfort and surgical competence during surgery, perioperative haemodynamicstability,less perioperative complications, thus reduced hospital stay.*

Key words: *Total intravenous anaesthesia; Chronic subdural haematoma; Propofol infusion; Perioperative complications.*

Bang. J Neurosurgery 2019; 8(2): 100-104

Introduction:

Total **i**ntra**v**enous **a**nesthesia (TIVA) is a technique of general anesthesia which uses a combination of agents given exclusively by the intravenous route without the use of inhalation agents (Gas Anesthesia)[1]. TIVA can be conducted either with a single drug or with a combination of drugs. The pharmacological profile(pharmacokinetics) of the drug help clarify its clinical implications and thus assist in drug selection. The most commonly utilized

1. Muhammad Shamsul Arefin, Junior Consultant, Dept. of NeuroAnaesthesiology, National Institute of Neurosciences & Hospital (NINS), Dhaka. email- dr.arefin20@gmail.com
2. Kazi Nur Asfia, Asst. Professor, Dept. of NeuroAnaesthesiology, National Institute of Neurosciences & Hospital (NINS), Dhaka.
3. Abdur Rahim, Resident, Dept. of Anaesthesia, Analgesia & Intensive Care Unit,BSMMU.
4. Dr. A.Z.M. Saifuddin, Junior Consultant, Dept. of NeuroAnaesthesiology, National Institute of Neurosciences & Hospital (NINS), Dhaka.
5. Dr. Md. Monzurul Islam, Asst. Register, Neurotrauma, National Institute of Neurosciences & Hospital (NINS), Dhaka.
6. Dr. Mir Mohammad Rifat Chowdhury, Jr. Consultant. National Heart Foundation. Dhaka.
7. Dr. Md. Imrul Islam, Medical officer, Dept. of Anaesthesiology & ICU, Rajshahi Medical College.
8. Dr. Syed Ariful Islam, EMO, 250 Bedded District Sadar Hospital, Brahmanbaria.
9. Dr. Md. Saydur Rahman, Asst. Professor, Green Life Medical College & Hospital, Dhaka.

Address of Correspondence: Dr. Muhammad Shamsul Arefin, Junior Consultant, Dept. of NeuroAnaesthesiology, National Institute of Neurosciences & Hospital (NINS), Dhaka. email- dr.arefin20@gmail.com

groups of drugs include hypnotics and short-acting opioids[2].

There is a solid rationale for the use of TIVA for some neuro-surgical cases where the delivery of inhaled anesthetics is impossible or disadvantageous or in scenarios where traditional anesthetic delivery systems may be unavailable. It is encouraged by the simplicity of the method, increased experience and declining costs with the propofol and fentanyl combination. The TIVA methods are well tolerated and perceived to give good quality patient care; with rapid, clear-headed emergence and low incidence of postoperative nausea and vomiting. Cost-efficacyandother benefits of recovery from TIVA. Further development of TIVA will include the refinement of target control systems, the introduction of new drugs and adjuvants and advanced equipment for automatic drug delivery, as well as improved effect monitoring.

Chronic subdural hematoma (CSDH) is a very common clinical entity encountered in neurosurgical practice.[3] CSDH is more common among elderly patients, who also have associated comorbidities and thus, are at increased risk of perioperative complications especially under GA.[4-8]

However, if the surgery is performed under LA with or without sedationthe patientcan experience discomfort during the surgical procedure. Sometimes drugs such as midazolam have been used for sedation with LA, causes a major side effect, respiratory depression .[8,9]

The primary objective of this study was to observe the outcome of Total intravenous anaesthesia with propofol for Burr hole drainage of CSDH. Secondary objectives were to observethe perioperative hemodynamic changes, the perioperative need of additional analgesics, postoperative complications, Ramsay Sedation Score (RSS).

Material and methods

This is a hospital based prospective randomizedcontrolled clinical trial.which was conducted in the Neurotrauma dept. of National institute of neuroscience hospital from the period of Dec 2017 to May 2018.Sixty adults pts age group ranging from 20-80 years without gender discrimination scheduled for Burr hole drainage of chronic subdural haematoma wereincluded in this study. The diagnosis was confirmed by CT scan and clinical status was assessed by GCS. The age group ranging from 20-80 yearswithout gender discrimination. The patients with CSDH who underwent other surgical treatments, such as twist-drill craniostomy (TDC), double burr-holecraniostomy (DBHC), craniotomy and evacuation of SAH,Extraduralhematoma, subduralempyema, CSDH with under lying brain contusion were excluded from this study.

After getting written consentfrom all patients, the patients were divided randomly into two groups using a computer generated random-number table and sealed-envelopes. The patients were randomized into two groups. Group A received propofol infusion and Group B received midazolam and saline infusion. In the operating room, routine monitoring included three-lead electro - cardiogram, mean arterial pressure (MAP), heart rate, pulse oximetry were attached. Baseline heart rate (HR), blood pressure (BP),SpO_2,GCS score andsedation score were recorded. At operation theatre each patient received an analgesic comprising fentanyl 0.5¼g/kg bolus and infiltration of skin with 2% lidocaine in epinephrine prior to induction. ThenSupplemental oxygen was administered at 4 L/min through oxygen maskto all patients.TheGroup A received Inj. propofol I/V @ 1mg/kg over 10 min followed by 25-50¼g/kg/ min infusion. Group B received Inj. Midazolam0.5mg/ kg I/V followed by normal saline infusion at 0.2 ml/ kg/hrinfusion.The degree of sedation was assessed using Ramsay Sedation Scale (RSS). Target score for adequate sedation was 6(no response to light glabellar tap or loud auditory stimulus). Intraoperatively, hemodynamic parameters (HR, mean arterial pressure (MAP), SpO_2, and Ramsaysedation score were monitored just after induction, just after incision,15 minutes,30 mins 60 mins and 90 mins interval. Once hemostasis achieved and skin closure was commenced,infusion pump stopped.A note was made of any untoward events or complications and the respective treatment given during operation (Rescue Drugs).After completion of the procedure, patientswere transfer to the postoperative ward and where HR, MAP, SpO_2,Ramsay sedation score and GCS were recorded at just after arrival in postoperative ward and intervals of 15 mins, 30 mins and 1 hour.

Statistical Analysis

The collected information was entered in statistical package of social sciences (SPSS) version16 and analyzed. Frequency and percentage, mean, SD, were calculated for desired variables by unpaired t test and chi square test.A *P*-value < 0.05 wasconsidered to be statistically significant.

Results:

We did not find any difference between the groups in terms of demographic parameters (Table-1).

Table-I

Demographic Data (Mean±SD)

Parameters	Group-A	Group-B	*p*-value
Age(years)	65.83 (±11.81)	63.5613.58)	0.48
Weight (Kg)	58.43±6.88	57.50±5.52	0.17
Male/female	11/13	10/16	0.598
BMI	22.72±2.60	22.52±2.18	0.45
GCSscore	8±2.8	8±1.09	0.321
Duration of surgery (Min.)	71.7±10.90	74.6±8.50	0.245

Values were expressed as mean+SD.*P*<0.05 was considered statistically significant.

There was a significant fall in HR following propofol group. The fall in HR was started from induction period and throughout the maintenance of anaesthesia in Group A, but not in Group B patients in whom it rose significantly during maintenance (Figure-1).

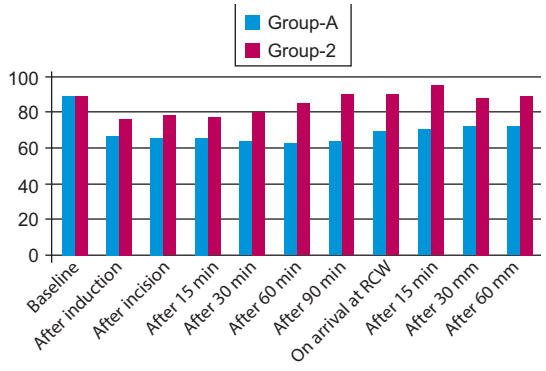

Fig.-1: *Heart rate*

Post induction mean arterial blood pressure values were not significantly different among both groups. All the MAP values in the rest of the periods were significantly higher in Group B patients when compared to Group A. (*p*=0.001) (Table-3).

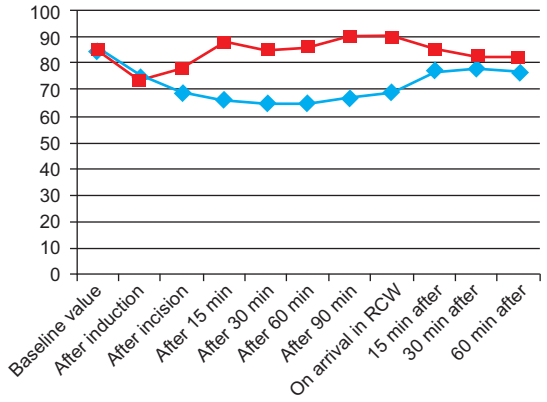

Fig.-2: *MAP (mean arterial pressure)*

During induction and incision targetsedation score was achieved in Group A patients when compared with Group B and throughout the maintenance periods and in recovery room RSS was higher in Group-A than Group-B. (Table-4. *(p*=0.001).

Table-II

RSS (Ramsay sedation score)

Intervals	Group A	Group B	P value
After induction	6±.182	3±0.182	0.001
After incision	6±0.50	4±.50	0.003
After 15 minutes	5±.182	4±.764	0.002
After 30 minutes	5±.37	4±0.68	0.002
After 60 minutes	5±0.43	4±0.60	0.003
After 90 minutes	4±0.53	3±0.87	0.002
On arrival at RCW	3±1.16	2±0.71	0.002
After 15 minutes at RCW	3±0.66	1±0.64	0.001
After 30 minutes at RCW	2±0.61	1±0.50	0.002
After 60 minutes at RCW	2±0.44	1±0.25	0.002

Values were expressed as number and mean+SD.*P*<0.05 was considered statistically significant.

Group-A require less rescue drug than Group-B. About 48.3%% of Group-B require midazolam to raise RSS level up to target sedation and 51% of Group-B require Ing. Fentanyl to abolish pain. But Group-A require onlyfentanyl (8.33%).

Table-III

Rescue drugs requirements

Drugs	Group A	Group B	p value
Inj. Midazolam	0	29(48.3%)	0.001
Inj. Fentanyl	5(8.33%)	55(91.6%)	0.001

Values were expressed as number and percentages. *P*<0.05 was considered statistically significant.

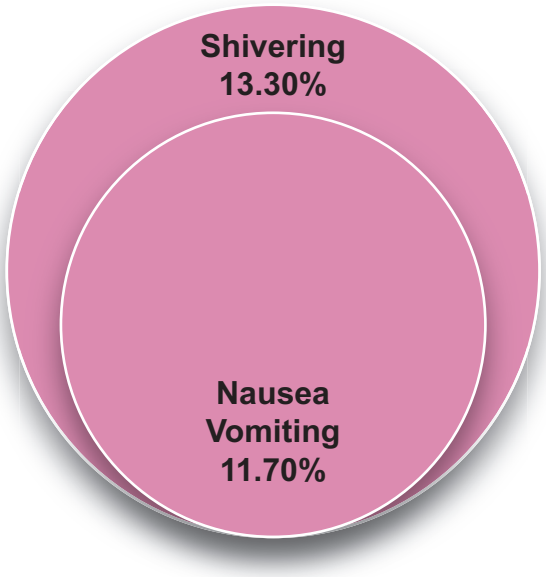

Fig.-3: *Perioperative complications*

Perioperative complications Nausea, vomiting (11.7%), Shivering (13.3%) in Group B was more and which was highly significant.

Discussion:

The inadequate sedative technique may adversely affect morbidity and even mortality. This studysuggests that the use of propofol in patients undergoing burr hole evacuation of CSDH is associated with haemodynamic stability, good operating conditions and greater surgeon satisfaction.Intraoperative patient movement, coughing and airway-related problems during surgery were more in Group-B than Propofol group.Monitored anaesthesiacare (MAC) has potential for a deeper level of sedation than that provided by sedation/ analgesia, andis always administered by an anesthesiologist. MAC enhanced patientcomfort and surgical competence during thesurgical procedure for CSDH.

It is well known that MAC with specific suitable agentsfor various neurosurgical procedures are widelyused.[10]As a further MAC can be consideredthe intermediate stage between general andlocalanaesthesia, and it is also safely employed in neurosurgery practice.

General anaesthesia may cause a delay in return tonormal levels of consciousness after a procedurethat does not permit rapid postoperative neurologicalexamination and often necessitates an urgentradiological evaluation to rule out the needfor immediate surgical evaluation.

The anesthesiologist's continuous attention is directed at optimizing patient comfort and safety. Conceptually, MAC is attractive because it involves less physiological disturbanceand allows more rapid recovery than generalanaesthesia.[12].

Surve et al.[12] showed better outcome of dexmedetomidine sedation with local anesthesiais a safe and effective technique for burr hole and evacuation of CSDH in 76 cases. It is associated withsignificantly shorter operativetime, lesser hemodynamic fluctuations, postoperative complicationsand length of hospital stay, thus it is a better alternativeto GA which have similaroutcome with our study.

Guzel and colleagues[13] were thefirst to report the successful use of the MAC with acombination of midazolam and fentanyl sedation in astudy which included 20 patients for CSDH surgery. They have also observedshorter operative time under MAC with midazolam andfentanyl sedation when compared with their previous casesoperated under GA

Inanother study, Bishnoi et al.[14] compared dexmedetomidinesedation against a combination of midazolam-fentanylsedation for burr hole and evacuation of subdural hematomain their randomized comparative study, which included a total of 52 patients. In their study, all the patientsunderdexmedetomidine sedation successfully completedthe procedure.

Xu et al.[15]have also reported the successfuluse of dexmedetomidinesedation for surgical evacuationof the CSDH in comparison with general anaesthesia. On comparing the 2 groups it was observed that the meananesthesia onset time, recovery time, and total duration ofthe procedure were significantly shorter in the dexmedetomidine group asagainst the GA group. The avoidance of intubation andextubation in the dexmedetomidine group could be the reason for shorteronset and recovery time and thus, in the total proceduretime.

A major concern during any procedure under sedationis respiratory depression, especially with the use ofmidazolam and fentanyl combination.[16] However, bothGuzel[12] and Bishnoi[14]with colleagues did not observe anyintraoperative respiratory depression or any other surgeryor anesthesia-related

complications under MAC in theirstudiesand showed significant improvement after surgery.

So, from previous discussion we can conclude that there is no comparison between two sedation procedure in most cases. Most of the procedure was compare MAC with GA for CSDH burr hole operation. Our study was done between the two most available,cheap in context of our country sedation technique comparing the effects of propofol and midazolam with local anaesthetics infiltration.Comparing two groups all patients successfully completed the whole operative procedure under sedation.

Although operative procedure done successfully in both group but in comparison to midazolam group, propofol sedation was better in terms of better perioperativehaemodynamics, less requirements of intraoperative and postoperative rescue drugs, perioperativecomplications. No paradoxical reaction found in both groups.

To conclude, propofolsedation with LA safe and effective technique for burr hole and evacuation of CSDH in comparison to midazolam sedation.It is associated with lesser hemodynamic fluctuations, perioperativecomplications, requirements of rescue drugs. So,it can be a better alternative to GA and other sedation techniques.

Conclusion:

Propofol is safer and more effective agent compared to fentanyl and midazolam for sedation ofburr hole and evacuation of CSDHwith good hemodynamic stability and expectedsedation score. Use of propofol also reduced preoperative fentanyl requirements and postoperative complications.

References:

1. Total Intravenous Anesthesia using a target-controlled infusion – A pocket reference', College of Anesthesiologists, Academy of Medicine Malaysia (retrieved 07.10.15).
2. Nora FS. Total intravenous anesthesia as a target-controlled infusion: an evolutive analysis. Revistabrasileira de anestesiologia. 2008 Apr;58(2):179-92.
3. Gelabert-González M, Iglesias-Pais M, García-Allut A, Martínez-Rumbo R. Chronic subdural haematoma: surgical treatment and outcome in 1000 cases. Clinical neurology and neurosurgery. 2005 Apr 1;107(3):223-9.
4. Ernestus RI, Beldzinski P, Lanfermann H, Klug N. Chronic subdural hematoma: surgical treatment and outcome in 104 patients. Surgical neurology. 1997 Sep 1;48(3):220-5.
5. MORI K, MAEDA M. Surgical treatment of chronic subdural hematoma in 500 consecutive cases: clinical characteristics, surgical outcome, complications, and recurrence rate. Neurologia medico-chirurgica. 2001;41(8):371-81.
6. Mekaj AY, Morina AA, Mekaj YH, Manxhuka-Kerliu S, Miftari EI, Duci SB, Hamza AR, Gashi MM, Xhelaj MR, Kelmendi FM, Morina QS. Surgical treatment of 137 cases with chronic subdural hematoma at the university clinical center of Kosovo during the period 2008–2012. Journal of neurosciences in rural practice. 2015 Apr;6(2):186.
7. 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. Neurosurgical review. 2002 Mar 1;25(1-2):89-94.
8. KUDO H, KUWAMURA K, IZAWA I, SAWA H, TAMAKI N. Chronic subdural hematoma in elderly people: present status on Awaji Island and epidemiological prospect. Neurologia medico-chirurgica. 1992;32(4):207-9.
9. Tobias JD, Leder M. Procedural sedation: a review of sedative agents, monitoring, and management of complications. Saudi journal of anaesthesia. 2011 Oct;5(4):395.
10. Manninen PH, Balki M, Lukitto K, Bernstein M. Patient satisfaction with awake craniotomy for tumor surgery: a comparison of remifentanil and fentanyl in conjunction with propofol. Anesthesia & Analgesia. 2006 Jan 1;102(1):237-42.
11. Horn EM, Feiz-Erfan I, Bristol RE, Spetzler RF, Harrington TR. Bedside twist drill craniostomy for chronic subdural hematoma: a comparative study. Surgical neurology. 2006 Feb 1;65(2):150-3.
12. Surve RM, Bansal S, Reddy M, Philip M. Use of dexmedetomidine along with local infiltration versus general anesthesia for burr hole and evacuation of chronic subdural hematoma (CSDH). Journal of neurosurgical anesthesiology. 2017 Jul 1;29(3):274-80.
13. Guzel A, Kaya S, Ozkan U, Aluclu MU, Ceviz A, Belen D. Surgical treatment of chronic subdural haematoma under monitored anaesthesia care. Swiss medical weekly. 2008 Jul 12;138(27-28):398-403.
14. Bishnoi V, Kumar B, Bhagat H, Salunke P, Bishnoi S. Comparison of dexmedetomidine versus midazolam-fentanyl combination for monitored anesthesia care during burr-hole surgery for chronic subdural hematoma. Journal of neurosurgical anesthesiology. 2016 Apr 1;28(2):141-6.
15. Xu XP, Liu C, Wu Q. Monitored anesthesia care with dexmedetomidine for chronic subdural hematoma surgery. Journal of neurosurgical anesthesiology. 2014 Oct 1;26(4):408-9.
16. Bailey PL, Pace NL, Ashburn MA, Moll JW, East KA, Stanley TH. Frequent hypoxemia and apnea after sedation with midazolam and fentanyl. Anesthesiology. 1990 Nov;73(5):826-30.