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

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Abstract:

**Background:** Burr hole drainage for chronic subdural haematoma is a common neurosurgical treatment. Traditionally, this was done under local anaesthesia with sedation. The primary aim of this prospective study was to assess the effects of Total intravenous anaesthesia with Propofol for Burr 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), SpO₂, 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 haemodynamic stability, less perioperative complications, thus reduced hospital stay.

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


Introduction:

Total Intravenous anesthesia (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

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groups of drugs include hypnotics and short-acting opioids.

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-efficacy and other 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. CSDH is more common among elderly patients, who also have associated comorbidities and thus, are at increased risk of perioperative complications especially under GA. However, if the surgery is performed under LA with or without sedation, the patient can 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.

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 observe the perioperative hemodynamic changes, the perioperative need of additional analgesics, postoperative complications, Ramsay Sedation Score (RSS).

**Material and methods**

This is a hospital based prospective randomized controlled 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 were included in this study. The diagnosis was confirmed by CT scan and clinical status was assessed by GCS. The age group ranging from 20-80 years without gender discrimination. The patients with CSDH who underwent other surgical treatments, such as twist-drill craniostomy (TDC), double burr-hole craniostomy (DBHC), craniotomy and evacuation of SAH, extradural hematoma, subdural empyema, CSDH with under lying brain contusion were excluded from this study.

After getting written consent from all patients, the patients were divided randomly into two groups using a computer generated random-number table and sealed-enzymes. 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), SpO₂, GCS score and sedation score were recorded. At operation theatre each patient received an analgesic comprising fentanyl 0.5-0.75 g/kg bolus and infiltration of skin with 2% lidocaine in epinephrine prior to induction. Then supplemental oxygen was administered at 4 L/min through oxygen mask to all patients. The Group A received Inj. propofol I/V @ 1mg/kg over 10 min followed by 25-50 μg/kg/min infusion. Group B received Inj. Midazolam 0.5mg/kg I/V followed by normal saline infusion at 0.2 ml/kg/hr infusion. 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), SpO₂) and Ramsay sedation 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, patients were transferred to the postoperative ward and where HR, MAP, SpO₂, 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) version 16 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 was considered to be statistically significant.

**Results:**

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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A</th>
<th>Group B</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>65.83 (±11.81)</td>
<td>63.56 (±13.58)</td>
<td>0.48</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>58.43±6.88</td>
<td>57.50±5.52</td>
<td>0.17</td>
</tr>
<tr>
<td>Male/female</td>
<td>11/13</td>
<td>10/16</td>
<td>0.598</td>
</tr>
<tr>
<td>BMI</td>
<td>22.72±2.60</td>
<td>22.52±2.18</td>
<td>0.45</td>
</tr>
<tr>
<td>GCS score</td>
<td>8±2.8</td>
<td>8±1.09</td>
<td>0.321</td>
</tr>
<tr>
<td>Duration of surgery (Min.)</td>
<td>71.7±10.90</td>
<td>74.6±8.50</td>
<td>0.245</td>
</tr>
</tbody>
</table>

Values were expressed as mean±SD. $P<0.05$ was considered statistically significant.

Fig. 1: Heart rate

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).

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>
<thead>
<tr>
<th>Intervals</th>
<th>Group A</th>
<th>Group B</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>After induction</td>
<td>6±1.18</td>
<td>3±1.82</td>
<td>0.001</td>
</tr>
<tr>
<td>After incision</td>
<td>6±0.50</td>
<td>4±5.0</td>
<td>0.003</td>
</tr>
<tr>
<td>After 15 minutes</td>
<td>5±1.37</td>
<td>4±7.64</td>
<td>0.002</td>
</tr>
<tr>
<td>After 30 minutes</td>
<td>5±0.43</td>
<td>4±0.60</td>
<td>0.003</td>
</tr>
<tr>
<td>After 60 minutes</td>
<td>4±0.53</td>
<td>3±0.87</td>
<td>0.002</td>
</tr>
<tr>
<td>On arrival at RCW</td>
<td>3±1.16</td>
<td>2±0.71</td>
<td>0.002</td>
</tr>
<tr>
<td>After 15 minutes at RCW</td>
<td>3±0.66</td>
<td>1±0.64</td>
<td>0.001</td>
</tr>
<tr>
<td>After 30 minutes at RCW</td>
<td>2±0.61</td>
<td>1±0.50</td>
<td>0.002</td>
</tr>
<tr>
<td>After 60 minutes at RCW</td>
<td>2±0.44</td>
<td>1±0.25</td>
<td>0.002</td>
</tr>
</tbody>
</table>

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 Inj. Fentanyl to abolish pain. But Group-A require onlyfentanyl (8.33%).

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Group A</th>
<th>Group B</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inj. Midazolam</td>
<td>0</td>
<td>29(48.3%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Inj. Fentanyl</td>
<td>5(8.33%)</td>
<td>55(91.6%)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Values were expressed as number and percentages. $P<0.05$ was considered statistically significant.
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 study suggests 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, and is always administered by an anesthesiologist. MAC enhanced patient comfort and surgical competence during the surgical procedure for CSDH.

It is well known that MAC with specific suitable agents for various neurosurgical procedures are widely used. As a further MAC can be considered the intermediate stage between general and local anaesthesia, and it is also safely employed in neurosurgery practice.

General anaesthesia may cause a delay in return to normal levels of consciousness after a procedure that does not permit rapid postoperative neurological examination and often necessitates an urgent radiological evaluation to rule out the need for 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 disturbance and allows more rapid recovery than general anaesthesia. However, both Guzel and colleagues showed better outcome of dexmedetomidine sedation with local anesthesia as a safe and effective technique for burr hole and evacuation of CSDH in 76 cases. It is associated with significantly shorter operative time, lesser hemodynamic fluctuations, postoperative complications and length of hospital stay, thus it is a better alternative to GA which have similar outcome with our study.

Guzel and colleagues were the first to report the successful use of the MAC with a combination of midazolam and fentanyl sedation in a study which included 20 patients for CSDH surgery. They have also observed shorter operative time under MAC with midazolam and fentanyl sedation when compared with their previous cases operated under GA.

In another study, Bishnoi et al. compared dexmedetomidine sedation against a combination of midazolam-fentanyl sedation for burr hole and evacuation of subdural hematoma in their randomized comparative study, which included a total of 52 patients. In their study, all the patients under dexmedetomidine sedation successfully completed the procedure.

Xu et al. have also reported the successful use of dexmedetomidine sedation for surgical evacuation of the CSDH in comparison with general anaesthesia. On comparing the 2 groups it was observed that the mean anasthesia oncset time, recovery time, and total duration of the procedure were significantly shorter in the dexmedetomidine group as against the GA group.

The avoidance of intubation and extubation in the dexmedetomidine group could be the reason for shorter onset and recovery time and thus, in the total procedure time.

A major concern during any procedure under sedation is respiratory depression, especially with the use of midazolam and fentanyl combination. However, both Guzel and Bishnoi with colleagues did not observe any intraoperative respiratory depression or any other surgery or anesthesia-related
complications under MAC in their studies and 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 perioperative haemodynamics, less requirements of intraoperative and postoperative rescue drugs, perioperative complications. No paradoxical reaction found in both groups.

To conclude, propofol sedation 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, perioperative complications, 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 of burr hole and evacuation of CSDH with good hemodynamic stability and expected sedation 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 Anaesthesiologists, Academy of Medicine Malaysia (retrieved 07.10.15).


