Comparative Study of Propofol and Thiopentone Sodium as Intravenous Induction Agents in General Anaesthetic Surgical Procedures in a Teaching Hospital

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Abstract  Thiopentone and propofol are the intravenous induction anaesthetic agents used during general surgery. The study was done with an aim to compare the intra operative and the Post operative findings in Propofol and Thiopentone groups. The study was conducted in 100 adult patients of ASA grade 1 and grade II of aged between 18-60 yrs of both sexes who were posted for different types of Surgical Procedures in department of anaesthesiology, General Hospital, RIMS, Srikakulam from January 2013 to October 2013. The intra-operative findings like Pulse rate, blood pressure and oxygen saturation were measured in both groups and no significance difference was observed for pulse rate and oxygen saturation except for Blood pressure. Post operative findings especially response time and Orientation time was less in patients receiving Propofol when compared with Thiopentone group which is highly significant. Incidence of nausea, headache and shivering were more with thiopentone sodium than with propofol. In this study we concluded that propofol is better alternative to thiopentone sodium as main anaesthetic agent for general surgical procedures with less side effects.

Keywords: propofol, thiopentone, anaesthetic agent and general surgical procedures


1. Introduction

Anaesthesia namely to create a reversible condition of comfort, quiescence and physiological stability in a patient before, during and after performance of a procedure that would otherwise be painful [1]. It immobilizes the patient and permits the performance of noxious or unpleasant surgical procedures [2]. It limits an excessive autonomic response and amnesia for the procedures [3]. The conventional method of inducing general anaesthesia with inhalation agents like ethyl chloride and ether takes long time for induction and for recovery [4]. Added to this the post operative sickness is another unwanted sequel of these methods. Intravenous induction scores over inhalational induction techniques with rapidity of onset, smooth induction, without irritation to the respiratory tract and cumbersome equipment [5]. Hexobarbital was introduced into clinical practice in Germany in 1932 and soon after in 1934 thiopentone was studied in the United States by Lundy in Rochester and Waters in Madison.[6] Thiopentone sodium is a very good intravenous induction agent but with some disadvantages like cardiovascular and respiratory depression, tolerance and cumulation [7]. To overcome all these disadvantages of thiopentone many induction agents like propofol, etomidate have come into vogue [8]. Use of thiopentone as sole agent lead to many deaths and it was termed as “ideal form of euthanasia” for patients in shock.[9] The newer intravenous anaesthetic drugs like propofol (2,6-di iso propyl phenol) can be given in the form of infusions for continuous sedation in the intensive care units.

Propofol is an alkyl phenol chemically designated as 2,6 di-iso propyl phenol. It was first administered to human volunteers in 1977 [10,11]. The present study was taken up with an idea to access the comparative effects of Propofol and Thiopentone sodium as induction agents in general anaesthetic procedures.

2. Materials and Methods

The study was conducted on a sample of 100 adult patients of ASA grade 1 and grade II aged between 18-60 yrs of both sexes during the period of January 2013-October 2013 who were posted for different types of
Surgical Procedures in department of anaesthesiology, RIMS, General Hospital.

The patients were randomized into two groups by using random tables. Group 1 patients received Propofol 2-2.5 mg per kg, and Group 2 patients received Thiopentone 4-6 mg per kg intravenously for the induction of anaesthesia. Induction time, pulse rate, blood pressure and oxygen saturation rate were recorded and base line findings during induction, 5thth and 15th, 30mins were recorded respectively throughout surgery. Presence or absence of apnoea, response of the patient to pain, periooperative evaluation for nausea and vomiting, recovery is all observed. Estimated dose of Propofol (1%) given over 20-30seconds IV to 1st group. Estimated dose of Thiopentone (2-5%) was given over 15-20 seconds IV for the second group. Patients were maintained on spontaneous ventilation by Magil’s breathing system with 67% nitrous oxide, 33% oxygen and 1% halothane. Incremental doses of the induction agents were given as required during the surgical procedure. At the end of the procedure, nitrous oxide was discontinued and 100% oxygen was given by mask for 3 minutes and then kept on spontaneous ventilation at room air. Patients were kept in the recovery area for two hours and discharged along with a responsible adult to accompany them. At the time of discharge, the patient’s consciousness, orientation, vital data and allergic manifestations, if any are observed. In the Thiopentone group, patients are advised not to drive vehicle for one or two days.

Data was analyzed using Microsoft excel and spss trial version 16 were used. Relevant statistical tests like standard error of difference between means, ANOVA, chi square test were used for inferences.

3. Results

In our study we have found that Propofol provided smooth and pleasant loss of consciousness. The time taken for induction of anaesthesia with both the drugs were similar and there is no statistically significant difference between the two groups (Z=1.7, p>0.05)

There is slight variation in pulse rate during the course of study (Table 1), pre operatively and post operatively there is no significant pulse variation between the groups. Regarding blood pressure changes, the fall in blood pressure was slightly more in Propofol group than Thiopentone which is statistically significant between the two groups through out the study (F=18.846, p<0.05 for Systolic BP and F=18.36, p<0.05 for Diastolic BP) (Table 2). Oxygen saturation has not shown much difference between the two drugs (Table 3).

Table 1. VARIATIONS IN PULSE RATE BETWEEN TWO GROUPS

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-operative</th>
<th>After Induction</th>
<th>5 Min</th>
<th>15 Min</th>
<th>30 Min</th>
<th>1 HR</th>
<th>1½ HR</th>
<th>2HR</th>
<th>Reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I Propofol</td>
<td>84.96 ±2.15</td>
<td>85.15 ±4.10</td>
<td>85.46 ±3.15</td>
<td>84.50 ±3.20</td>
<td>85.00 ±2.16</td>
<td>83.36 ±3.10</td>
<td>82.31 ±2.25</td>
<td>81.15 ±3.16</td>
<td>85.50 ±3.18</td>
</tr>
<tr>
<td>Group II Thiopentone</td>
<td>85.93 ±3.15</td>
<td>89.75 ±2.16</td>
<td>87.75 ±3.10</td>
<td>84.45 ±4.05</td>
<td>82.31 ±2.25</td>
<td>81.18 ±3.16</td>
<td>85.15 ±2.15</td>
<td>83.18 ±3.18</td>
<td>85.16 ±2.17</td>
</tr>
</tbody>
</table>

Table 2. VARIATIONS IN BLOOD PRESSURE BETWEEN TWO GROUPS

<table>
<thead>
<tr>
<th>Group</th>
<th>Base line</th>
<th>Induction</th>
<th>5 Min</th>
<th>15 Min</th>
<th>30 Min</th>
<th>1 HR</th>
<th>1½ HR</th>
<th>2HR</th>
<th>Reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Propofol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAP</td>
<td>122 ±10</td>
<td>99 ±9</td>
<td>103 ±5</td>
<td>108 ±9</td>
<td>104 ±8</td>
<td>106±8</td>
<td>104±7</td>
<td>109±11</td>
<td>112±12</td>
</tr>
<tr>
<td>DAP</td>
<td>85 ±9</td>
<td>69 ±5</td>
<td>75 ±8</td>
<td>77 ±7</td>
<td>72 ±8</td>
<td>73 ±6</td>
<td>73 ±4</td>
<td>74 ±7</td>
<td>81±9</td>
</tr>
<tr>
<td>Group II Thiopentone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAP</td>
<td>127 ±5</td>
<td>110 ±6</td>
<td>114 ±9</td>
<td>118±8</td>
<td>116 ±7</td>
<td>107±7</td>
<td>112±8</td>
<td>114±6</td>
<td>119±9</td>
</tr>
<tr>
<td>DAP</td>
<td>86 ±4</td>
<td>75 ±6</td>
<td>78 ±8</td>
<td>82 ±5</td>
<td>84±8</td>
<td>85 ±7</td>
<td>81 ±8</td>
<td>78 ±6</td>
<td>83 ±10</td>
</tr>
</tbody>
</table>

Table 3. VARIATIONS IN OXYGEN SATURATION BETWEEN TWO GROUPS

<table>
<thead>
<tr>
<th>Group</th>
<th>Base line</th>
<th>Induction</th>
<th>5Min</th>
<th>15 Min</th>
<th>30 Min</th>
<th>1 hr</th>
<th>1½ hr</th>
<th>2 hr</th>
<th>Reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I Propofol</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>96±4</td>
</tr>
<tr>
<td>Group II Thiopentone</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>96±4</td>
</tr>
</tbody>
</table>

Recovery was very rapid and smooth in patients who received Propofol. Response time was less than 3mins in patients receiving Propofol whereas with Thiopentone it was upto 8.5mins which is highly significant (Z=4.19, p<0.001). Orientation time was less than 4mins in patients with propofol & 9.5mins in pts receiving thiopentone which is highly statistically significant (Z=5.5, p<0.001) (Table 4).

Table 4. SHOWING THE VARIATION IN THE RESPONSE TIME AND ORIENTATION TIME

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Recovery</th>
<th>Propofol group (minutes)</th>
<th>Thiopentone group (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Response Time</td>
<td>2.3 ±0.46</td>
<td>7.11±0.72</td>
</tr>
<tr>
<td>2.</td>
<td>Orientation time</td>
<td>3.68 ±0.66</td>
<td>8.86 ±0.83</td>
</tr>
</tbody>
</table>

The incidence of nausea during post anaesthetic period is more with thiopentone sodium than propofol which is statistically significant ($\chi^2$=13, p<0.05) The incidence of headache was more in thiopentone than propofol group, which is statistically significant ($\chi^2$=14, p<0.05) (Table 5). There was no complaint of emergence of psychoses in both the groups. The incidence of shivering was more in thiopentone than Propofol group which is stastically significant ($\chi^2$=10, p<0.05) and also the rise in pulse rate was more with thiopentone than with propofol.
Overall the post anaesthetic period with propofol produced less side effects than thiopentone sodium.

4. Discussion

In our study fall in systolic and diastolic blood pressure which were more marked with propofol and rise in pulse rate in response to induction was more with thiopentone than propofol and these results were consistent with the study of Yang CY et al. [12] who studied haemodynamic responses of thiopentone and propofol during induction and intubation in Chag Gung memorial hospital, Taiwan. Similar study results were found with the studies ofdjordjevic B et al [13] who showed propofol had greater efficacy, tolerability and lowest incidence of adverse effects.

In our study the mean induction time was longer in propofol (53.16sec) than thiopentone (47.38sec). Similar results were found with the study of Kashtan H. Edelist G et al, who ended with conclusion that induction of anaesthesia was slightly longer with propofol (42.2sec) than thiopentone (29.8 sec) [14].

In our study response time was better with propofol (2.3 mins) than for thiopentone (7.11mins). and orientation time were faster in propofol group (3.68 mins) than thiopentone (8.86 min). These results were similar with the study of Kashtan H.et al. for recovery characteristics. Study concluded that response time was 6.4 and 13.9 mins respectively with propofol and thiopentone and regarding Orientation time was 9.1min with propofol and 12.3min with thiopentone group.

In our study the incidence of nausea was more with using thiopentone (19.99%) than using Propofol (2.33%) suggesting that patients with propofol anaesthesia had lower emetic scores than thiopentone. These results were similar with the study of Klockgether - Radke. [15]

In our study post operative shivering was less with propofol (3.66%) when compared to thiopentone group (17.66%). The results were similar to the studies of Cheong KF, Chen FG.et al. [16] and Runcie C et al [17]. Cheong KF, Chen FG, et al concluded that propofol (10%) as an induction agent is associated with a lower incidence of post-anaesthetic shivering as compared to Thiopentone (25%). Runcie C et al observed that the post operative shivering (23%) in propofol significantly less when compared to (38%) in Thiopentone group.

5. Conclusion

In this study we conclude that propofol is better alternative to thiopentone sodium as main anaesthetic agent for general surgical procedures with less side effects in the post operative period and early recovery.

References