

## **Comparative Study between Propofol and Thiopentone Combined With Fentanyl In Short Surgical Procedures**

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### **I. Introduction**

As the field of short surgical procedures is expanding day by day with desired minimum stay in hospital. Day care anaesthesia is gradually getting more importance and attention for success of such procedures. An untiring effort has been made from a long time in search of such an anaesthetic agents which can overcome pain and can make surgical procedures more comfortable. A variety of intravenous agents have been used for induction or maintenance of anaesthesia in day care surgery like Thiopentone Sodium, Ketamine, Propofol, Midazolam, Fentanyl, Alfentanyl, Remifentanyl, etc. But none of these drugs is considered to be an ideal anaesthetic agent for day care anaesthesia practice.

Propofol was introduced into clinical practice in 1984. It produces rapid, smooth induction of anaesthesia and fast recovery with low incidence of postoperative nausea vomiting. When used in combination with fentanyl, Propofol is suitable for the provision of total intravenous anaesthesia (TIVA) in Day Care Surgery. Fentanyl is low molecular weight, highly lipid soluble, short acting (Half life 30-50 minutes) potent opioid analgesic, which has got rapid onset and elimination. After intravenous administration of Fentanyl (2-4 µg/Kg.) the patient remains drowsy and sedated but he is arousable.

Thiopentone is a derivative of barbituric acid, it is the most widely used inducing agent, was first administered in 1934 by Waters and Lundy.

In this study Propofol with Fentanyl and Thiopentone with Fentanyl have been assessed for short surgical procedures like Dilatation & Evacuation, Dilatation & Curettage, Urethral dilatation, Cystoscopy, Fracture reduction, Tube ligation, Abscess drainage, etc. and evaluate with regard to induction time, dose requirement, recovery time, postoperative nausea, vomiting, Cardio respiratory stability and other systemic effects like pulse, blood pressure, SpO<sub>2</sub>, and bronchospasm.

### **II. Materials And Methods**

For the purpose of present study 100 patients of ASA Grade I and II of both sexes aged between 15-40 years were admitted in different departments of Patna medical college & hospital for the short surgical procedures. All patients in this series were put up for elective surgery.

The short surgical procedures included were D(Dilation) & E(Evacuation), D(Dilation) & C(Curettage), Cystoscopy, Vasectomy, Tube ligation, Testicular biopsy, Urethral dilation and Fracture reduction, etc. Patients were randomly divided in 2 groups of consisting 50 patients in each group.

#### **Plan & Consent:**

All the patients in both study groups were explained the purpose and nature of study. It was also explained to them that their co-operation was necessary for the success to study.

- Informal consent was taken from all the patients and they were explained about nature of anaesthesia to be given & risks involved.
- Patients were asked to remain fasting for six hours prior to surgery.

Pre-medication: 0.2 mg of Glycopyrrolate was given I.M. 1 hour prior to surgery to the entire patient in both groups.

Drug used:- Group I - Propofol + fentanyl

Each patient in this group was given Fentanyl in a dose of 2µg/kg intravenously as analgesic. Then 1% propofol in a dose of 2mg/Kg intravenously given over duration of 45 seconds.

Group II - Thiopentone + Fentanyl

In this group each patient was given Fentanyl in a dose of 2µg /kg intravenously as analgesic. Then 2.5% Thiopentone in a dose of 5 mg/kg intravenously was given.

### **III. Observation**

Following parameters were observed:

(A) Induction time in seconds (The loss of eyelash reflex was used as criteria for end-point of induction).

- (B) Amount and number of supplementary doses of Propofol and Fentanyl in mg.
- (C) Pulse, BP, SpO<sub>2</sub> & ECG were observed before induction, 1 minute, 2 minutes, 5 minutes & 15 minutes after induction, 1 hour and 2 hours post operatively.
- (D) Duration of surgery in minutes.
- (E) Unwanted side effects
- (F) Recovery time in minutes (Patients fully conscious and oriented to time, place & person) as assessed by Glasgow Coma Scale. Patients having Glasgow Coma Scale more than twelve (>12) were considered to be recovered.

#### **IV. Results**

The present study was conducted on 100 patients who were divided equally into 2 groups. Group PF patients (n = 50) received Propofol (2 mg/Kg.) + Fentanyl 2 µg/kg and group TF (n = 50) received Thiopentone (5 mg/Kg.) + Fentanyl 2µg/kg.

The age groups of patients were ranging from 20-50 years and the mean age of group PF is  $31.66 \pm 8.49$  and that of group TF is  $32.78 \pm 78$ . The sex distributions of the patients in the two study groups are almost similar. The patients in the both groups are of comparable body weight.

The average induction dose of Propofol is  $103.36 \pm 13.16$  mg and maintenance dose (mg) is  $34.40 \pm 5.01$ , whereas average induction dose of Thiopentone is  $258.3 \pm 30.84$  mg and maintenance dose (mg) is  $39.20 \pm 6.95$ . The dosage of Fentanyl is fixed and equal in both groups ( $2\mu\text{g}/\text{kg}$ ). Significantly more patients required maintenance doses of Thiopentone than Propofol i.e 50 patients or 100% in group-PF as compared to 21 patients (42%) ( $P < 0.001$ ) in group-TF. It is evident that mean induction time in second is lower in group-PF is  $30.28 \pm 1.73$  than in group-TF is  $32.16 \pm 2.24$ , but it was found non significant ( $p > 0.001$ ).

The maximum fall of heart rate (Beat per minute)  $77.50 \pm 6.23$  occurred after 2 minutes in Group-PF. In group-TF the heart rate  $76.1 \pm 5.97$  decreased slightly at 1 minute but increased marginally  $81.42 \pm 5.53$  above baseline value at 2 minutes and then again decreased  $79.56 \pm 5.79$  at 5 minutes. So average Mean Heart rate in Group - PF  $82.30 \pm 8.63$  & Group-TF  $81.18 \pm 5.82$  and it was found statistically non significant when compared with respective baseline values of HR.

Blood pressure(mm/Hg) in group-PF there was significantly decrease in systolic  $108.84 \pm 5.9$  at 2 minutes after induction and in group-TF  $114.28 \pm 3.81$  at 1 min &  $115.68 \pm 4.26$  at 2 min after induction. The differences of BP in between groups were statistically non significant .

The mean values of SPO<sub>2</sub>(%) in groups-PF range from  $97.72 \pm 1.62$  to  $98.02 \pm 1.09$  were as in group-TF was  $98.04 \pm 1.55$  to  $97.92 \pm 1.13$  and it showed statistically non- significant.

The duration of surgery(Minute) is group-PF and group-TF  $17.34 \pm 1.92$  and  $18.08 \pm 2.4$  respectively and it was found statistically insignificant ( $P > 0.05$ ).

The recovery time is lesser in group-PF is  $43.18 \pm 2.74$  as compared to group-TF is  $53.10 \pm 2.61$  and statistically significant ( $p < 0.01$ ). Glasgow coma scale was used to assess the degree of consciousness and thus judge the recovery time. Patient having Glasgow coma scale more than twelve (>12) were considered to be recovered from anaesthesia. A higher degree of consciousness shown by higher score in Glasgow coma scale was found at 30 minutes after termination of anesthesia with group-PF compared with group-TF. However, by 180 minutes there was no longer any significant difference in degree of consciousness between the two groups.

The discharge time in groups-PF & group-TF is  $367.24 \pm 10.88$  and  $371.72 \pm 10.19$  respectively and statistically insignificant ( $p > 0.05$ ). Modified post anaesthesia discharge scoring system (MPDSS) was used for discharge of patients.

Various side effects and complications in Group-PF & TF is the incidence of nausea and vomiting was more in group-TF. Dizziness, Headache was also more in Group-TF. The incidence of apnea was also greater in group-TF. In total the side effects were more in Group TF but the difference in between the two groups were, however, statistically insignificant.

#### **V. Discussion**

In this study a clinical comparison had been made between combination of Thiopentone and Fentanyl with Propofol and Fentanyl.

The study reveals induction time was found to be  $30.28 \pm 1.73$ sec in Propofol group and  $32.16 \pm 2.24$ sec in Thiopentone group. Induction time with Propofol is slightly lower than

Thiopentone but it is not statistically significant in our study(Lengley & Heel et al 1988,Boysen et al1989,Korttila et al 1992)

This may be explained by almost equal lipid solubility of both drugs. In a different study carried by Rolly G et al; 1985, they found that induction time with Propofol was  $30.5 \pm 2.7$  sec when Propofol was used in dose of 2mg/kg where as induction time with Thiopentone was  $34.6 \pm 2.7$  sec when Thiopentone was used in dose of 4mg/kg. Results of this study were shown higher value of induction time with Thiopentone. it could be due to lower dose of Thiopentone (4mg/kg). In another study carried by Perry SM et al; 1988 also found that induction time with Propofol was lesser than Thiopentone but it was not statistically significant<sup>[97]</sup>.

Maintenance of anaesthesia was relatively smooth in Propofol group as there were fewer requirements for supplemental infusion dose, where as in the Thiopentone group there were more requirements as supplemental infusion dose.

In cardiovascular effects we compared heart rate (HR) in between group-PF and group-TF at different time interval. Mean baseline HR in Propofol group ( $82.3 \pm 8.63$  beats/mint). After induction there was marginal fall in HR at all recorded timing. Maximum fall occurred 2 minutes after induction ( $77.5 \pm 6.23$  beats/mint). The reduction was not statistically significant when compared to pre-induction value. Thiopentone also caused a marginal fall in the HR at one minutes ( $76.1 \pm 5.97$  beats/mint) but this returned to marginally above the pre-induction value ( $80.18 \pm 5.82$  beats/mint) at second minute. However, in both groups, these changes were not significant. Above findings are consistent with finding of Monedero Rodriquez P et al; 1991 who performed similar study using Propofol in a dose of 2mg/kg and Thiopentone in a dose of 5mg/kg<sup>[83]</sup>.

Thiopentone caused significant fall in Blood pressure (BP) at 1 minute ( $114.28 \pm 3.81$ mm Hg) from pre induction value ( $120.24 \pm 3.01$  mm Hg) and this fall persisted till 2<sup>nd</sup> minute ( $115.68 \pm 4.26$ mmHg) as well. At 5 minutes blood pressure increased to some extent ( $119.16 \pm 2.53$ mmHg) but it was still below baseline. On the other hand Propofol also caused hypotension which was significant only at 2 minutes ( $108.84 \pm 5.9$ mm Hg) when compared with pre-induction value ( $121.68 \pm 3.62$ mm Hg).In further readings blood pressure was stable in both groups in my study.

In this study we found that Propofol caused more fall in systolic blood pressure than Thiopentone. But the differences were not significant when compared between the two groups at any time of recording. Similar findings were obtained in a different study carried by Perry S M et al; 1988, who performed his study with Propofol (2.5mg/kg) and Thiopentone (4.0mg/kg) on patient of ASA class I or II. In their study they found that Propofol administration produced fall in systolic blood pressure, from  $134 \pm 2.6$  mmHg before induction to  $118 \pm 2.7$ mmHg two minutes after induction. Where as in Thiopentone group systolic blood pressure fell to  $126.4 \pm 3.4$  mmHg at two minute from pre induction value of systolic blood pressure  $131.7 \pm 2.7$ mmHg.

The incidence of apnoea after induction was found to be more with Thiopentone group than with propofol group. When apnoea more than ten seconds was suspected, subsequently managed with 100% oxygen through face mask with positive pressure ventilation if required. Eight patients out of fifty (16%) in Thiopentone + Fentanyl group, where as only four patients out of fifty (8%) in Propofol + Fentanyl group had apnoeic episode. Thus we see that respiratory depression occurs less frequently with Propofol than with Thiopentone. This finding of my study is consistent with the finding of study carried by Valtonen M et al; 1988

Recovery Time was significantly faster after PF group anaesthesia ( $43.18 \pm 2.74$ sec) as compared to TF group anaesthesia ( $53.10 \pm 2.61$ sec).Our findings are consistent with findings of different studies (Rolly G *et al.*, 1985, Weightman WM, *et al.*, 1987, Kashtan H *et al.*, 1990).They found that time to eye opening and response to verbal command were significantly shorter after Propofol administration. High clearance rate of Propofol as compared to Thiopentone could be the possible explanation for early recovery after propofol anaesthesia

There were fewer side effects like nausea and vomiting were most common in both treated group. this study shown nausea occurred in 20 % in group-PF and 48 % in group -TF and vomiting occurred in 16% in group -PF and 30% in group-TF. Similar results were obtained in a different study carried by Myles PS *et al.*, 1996.

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### References

- [1]. Langley MS and Heel RC. Propofol a review of its Pharmacodynamic and pharmacokinetic properties and use as an intravenous anaesthetic druges.1988;35:334-372
- [2]. Boysen et al .Acta Anaesthesiologica Scandinavica 12/1980 ;33(8):689-92
- [3]. Korttila K.The study of post operative nausea and vomiting BJA 1992;69:205-235.
- [4]. Rolly G, Versichelen L. Comparison of propofol and thiopentone for induction of anaesthesia in premedicated patients. Anaesthesia. 1985 Oct; 40(10):945-8.
- [5]. Perry SM, Bullington J, Davis L, Fisher K, Ramsay S, Wood M. Comparison of propofol and thiopental for the induction of anesthesia. South Med J. 1988 May; 81(5):611-5.
- [6]. Monedero Rodríguez P, Panadero Sánchez A, García PedrajasF,Carrera Hueso J, Catalá Bauset JC, Arroyo Carreras JL Comparative study between thiopental and propofol in short-duration anesthesia Rev Esp Anesthesiol Reanim. 1991 May-Jun;38(3):141-2.
- [7]. Valtonen M, Iisalo E, Kanto J, Tikkanen J. Comparison between propofol and thiopentone for induction of anaesthesia in children. Ontario.Anaesthesia. 1988 Aug; 43(8):696-9.
- [8]. Weightman WM, Zacharias M. Comparison of propofol and thiopentone anaesthesia (with special reference to recovery characteristics). Anaesth Intensive Care. 1987 Nov; 15(4):389-93.