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RESEARCH ARTICLE

A Clinical Evaluation Of Propofol In Short Surgical Procedures And Comparison With Thiopentone Sodium As Induction Agent In Immunocompromised HIV Patients

Lalit Kumar Garg[1] | Anjna[2] | Deepak Berry[3] | Tanveer Singh Kundra[4*]

[1]MBBS, MD (Anaesthesiology), Assistant Professor, Government Medical College, Rajindra Hospital, Patiala, India

[2]MBBS, MS (General Surgery), Assistant Professor, Government Medical College, Rajindra Hospital, Patiala, India

[3]MBBS, MD (Anaesthesiology), Medical Officer, Government Multispeciality Hospital, Sector 16, Chandigarh, India

[4]MBBS, DA, DNB (Anaesthesiology), DM (Cardiac Anaesthesia), Assistant Professor, Government Medical College, Rajindra Hospital, Patiala, India

Abstract

BACKGROUND:Numerous attempts have been made in the past for the selection of an ideal intravenous anaesthetic agent for short surgical procedures in immunocompromised patients. The present study compared the effect of two drugs namely propofol and thiopen-tone sodium as an induction agent in short surgical procedures in immunocompromised HIV patients.

Materials and Methods: This was a randomized study evaluating two drugs- propofol and thiopentone sodium in short surgical procedures. It was carried out on 100 immunocompromised HIV patients in age group of 18-45 yrs of ASA grade 1/2 undergoing short surgical procedures . These patients were randomly divided into 2 groups 1 and 2 which were further subdivided into 1a and 1b , 2a and 2b respectively, each consisiting of 25 pts.

Group 1a and 2 a were given inj pentazocine 30mg and inj promethazine 25mg

Group 1b and 2b were administered 2 ml of saline .

Group 1a and 1b received inj propofol 1%i/v dose 2.5mg/kg wt and group 2a and 2b were given inj thiopentone 2.5% i/v at dose of 5mg/kg wt.

RESULT: Propofol showed a greater decrease in diastolic and systolic BP at induction, and a decrease in respiratory rate with more incidence of apnea.

CONCLUSION: Propofol produces rapid, pleasant and safe anaesthe-sia, with smooth recovery while thiopentone is associated with poor psychomotor recovery in immunocompromised HIV patients.

Keywords: Propofol, Thiopentone sodium, Short surgical procedures, immunocompromised, HIV

1 | BACKGROUND:

Ambulatory surgery has undergone a tremendous progress in recent times. It saves time and hospital bed space and also helps in decreasing morbidity. The major emphasis in such short procedures performed on out patient basis is on rapid, complete and uneventful recovery so that patient may be discharged with in hours. Day care anaesthesia is gradually getting more importance and attention for success of such procedures.

Various agents like thiopentone sodium, propofol, ketamine, midazolam have been used as intravenous induction agents in day care surgery.

Intravenous induction of anesthesia has advantages over inhalational induction like smooth and pleasant induction, avoiding fear and suffocation of face mask and irritation to respiratory tract, and smooth recov-ery.

Advantages with propofol in short procedures include smooth induction, rapid elimination from blood, rapid recovery of cognitive and psychomotor functions with a very low incidence of post-operative nausea and vomiting. It is suitable for the provision of TIVA (total intra venous anaesthesia) in day care surgery.

Thiopentone, an ultra short acting barbiturate, was first administered in 1934 . It has been widely used as an anaesthetic agent with a lot of advantages, but it has certain disadvantages also.

HIV- HIV belongs to Lentivirus group of retroviruses. Two distinct variants, HIV 1 and 2 have been identified with HIV 2 predominantly found in Africa. Retroviruses contain the enzyme reverse transcriptase that allows viral RNA to be transcribed to DNA which is then incorporated to host cell genome. The virus preferentially infects T helper lymphocytes (CD4 T cells) and progressively destroys them. This leads to increased susceptibility to opportunistic infections and malignancies.[1]

In the present era with good availability of retroviral drugs, even in far off areas, the number of patients with HIV presenting for surgery is increasing due to increase in life span of these patients.

A good knowledge about immunological effects of anaesthesia and effects of anaesthetic agents on immunosuppressed patients (transplant patients, AIDS patients), would serve our profession's obligation to ensure patient safety and good perioperative outcome.

Etomidate, which otherwise is a very good and stable induction agent in day care surgeries, cannot be used in immunocompromised patients due to fear of adrenal suppression.

Opiates like morphine have been shown to reactivate or stimulate HIV reproduction in in-vitro cultures of human Kupffer cells or peripheral blood monocytes.[2] Morphine may also activate HIV-I transinfection into cultured human neuroblastoma cells.[3] Hence, opiate induction is also not suitable in immunocompromised HIV patients.

The primary purpose of this study is to evaluate the usefulness and safety of propofol as intravenous anaesthetic agent for short surgical procedures and to compare induction and recovery characteristics of propofol with thiopentone in immunocompromised HIV patients.

2 | MATERIALS AND METHODS

Inclusion criteria:

100 immunocompromised HIV patients in age group of 18-45 yrs of ASA grade 1/2 undergoing short surgical procedures of upto 15 min duration were selected for study.

These patients were randomly divided into 2 groups 1 and 2 which were further subdivided into 1a and 1b , 2a and 2b respectively, each consisiting of 25 pts.

Supplementary information The online version of this article (https://doi.org/10.15520/ijmhs.v11i05.3298) contains supplementary material, which is available to authorized users.

Corresponding Author: *Tanveer Singh Kundra MBBS, DA, DNB (Anaesthesiology), DM (Cardiac Anaesthesia), Assistant Professor, Government Medical College, Rajindra Hospital, Patiala, India Email: tvskundra@yahoo.co.in*

Group 1a and2 a were given inj pentazocine 30mg and inj promethazine 25mg as premedication 30 mins before anaesthesia.

Group 1b and 2b were not given any premedication and they were administered 2 ml of saline .

Group 1a and 1b received inj propofol 1% i/v dose 2.5mg/kg wt and group 2a and 2b were given inj thiopentone 2.5% i/v at dose of 5mg/kg wt.

The short surgical procedures included were Dilatation & Curettage, cervical biopsy, hydrotubation, biopsies, suturing, circumcision, any other surgery lasting less than 15min.

The Consort Diagram is shown in Table 1.

Exclusion criteria:

Patient with bleeding tendency, anaemia, known allergy to thiopentone/ propofol, those suffering from cardiovascular, psychiatric, convulsive, endocrinal disorders, morbid obese patients.

Consent- All the patients in both the groups were explained the purpose and nature of study. Written informed consent was taken from all patients.

They were asked to remain fasting 6 hours before the procedure.

TECHNIQUE:

In the operation theatre, BP monitoring, ECG, $EtCO_2$ and heart rate monitoring was done. Baseline vitals were recorded.

Anaesthesia was induced in grp 1a and 1b patients by administering 1% solution of propofol 2.5 mg/kg body wt i.v over a period of 30seconds. In group 2a and 2b, the induction was done by 2.5% thiopentone 5mg/kg body wt injected over 30 seconds. The patients were asked to count from the beginning of the injection. The induction time was the time from start of injection to stoppage of counting. A successful induction was defined when there is no resistance to application of face mask.

The onset of apnea, if it occurred, was noted and its duration was recorded till the return of spontaneous respiration as observed by the movement of chest. Apnea of more than 20 seconds was considered significant. If any patient failed to fall asleep with in one minute of the first dose, a second dose was administered. Preoxygenation with 100% O_2 was done for 3 mins. After induction, 70% nitrous oxide and 30% oxygen was administered. No muscle relaxant was used.

The depth of anaesthesia was assessed by presence or absence of involuntary movements, sweating and hemodynamic response. Anaesthesia was maintained with 70% nitrous oxide and 30% oxygen with intermittent bolus of 25% induction dose of the test drugs in response to clinical signs of light anesthesia as judged by changes in heart rate, resp rate and BP. The physiological variables were recorded every two minutes during maintenance period.

When the operative procedure terminated, nitrous oxide was stopped and 100% oxygen given . Every 30 seconds the pt was asked to open his eyes.

The Evaluation of induction:

1. Excellent : If the patient fell asleep in the first minute and remained asleep .

2. Good: If the patient fell asleep in the first minute but required a second dose before the 3 min period has elapsed.

3. Poor: If the patient did not fall asleep within one minute or awoke within 3 min and did not fall asleep with the second dose.

Maintenance of anaesthesia was rated as:

1. Excellent : If respiratory and hemodynamic parameters remained within 10% of preoperative values with an oxygen saturation of >95%

2. Good : If mild respiratory or hemodynamic depression occurred, defined as B.P and pulse remaining within 30% of preoperative with no ECG dysrythmia and O2 saturation 90-95%.

3. Poor: If there is evidence of moderate or severe respiratory or hemodynamic depression, defined as blood pressure and pulse rate changes more than 30% of preoperative values and or any ECG dysrythmias and O2 saturation below 90%.

Emergence from anaesthesia was noted by the appearance of spontaneous eye opening after the stoppage of the anaesthetic agent.

Observations were recorded on the proforma and results were statistically analysed.

Observations:

Statistical analysis: Results were analysed statistically with student unpaired t test and chi square test.

The distribution of patients according to age was comparable in all the four groups and statistically non-significant (p value >0.05). The distribution of patients according to weight was comparable in all the 4 groups and statistically non-significant (p value >0.05).

1. Mean duration of anaesthesia- Duration of anaesthesia was comparable in all groups and statistically non significant (Table 2).
2. Comparison of mean induction time (seconds)- Mean induction time was almost similar in all the 4 groups and on statistical analysis, it was found to be insignificant (Table 3).
3. Mean BP changes at different time intervals- Comparison of mean BP at induction between group 1a and 1b, 2a and 2b was statistically non–significant (Table 4).
4. Mean pulse rate changes at different time intervals (Table 5).
5. Mean respiratory rate changes at different time intervals (Table 6).
6. Number of patients who became apneic in all 4 groups- Five patients in Group 1a (20%) and four patients in Group 1b (16%) became apneic. On the other hand, three patients in Group 2a (12%) and two patients in Group 2b (8%) became apneic. Apnea was more in propofol group.
7. Overall efficiency evaluation- Induction was excellent in all patients in Groups 1a and 1b, while it was 96% in Groups 2a and 2b. The remaining patients had a good induction. Maintenance was excellent in 92% patients in all 4 groups. In the remaining patients, it was classified as a good maintenance.
8. Showing complications at time of recovery of all the groups- One patient in Group 1a (4%) had nausea, while none in Group 1b had any nausea. Three patients in Group 2a (12%) and two patients in Group 2b (8%) had nausea. While none of the patients in Group 1a and 1b had any vomiting, three patients in Group 2a (12%) and two patients in Group 2b (8%) had vomiting.

Three patients in Group 1a and 1b (12% each) had euphoria, while none in Group 2a and 2b had euphoria.

While none of the patients in Groups 1a, 1b and 2a had any headache, three patients in Group 2b (12%) complained of headache.

3 | DISCUSSION

The pandemic of HIV is virtually creating a panic among health workers which include medical and paramedical staff. On a global basis, 40 million people are living with HIV, with India accounting for 5.2 million.[4] With the advancement of the management techniques, the life span of infected patients is on the increase so that more patients will come for surgical procedures in the future.

HIV disease is a complex medical disorder with widespread systemic involvement in effect to become a medical sub specialty. The neurological, pulmonary, cardiovascular and haematological abnormalities are of particular concern to anaesthesiologists.[5] There is little information on the risk of anaesthesia in HIV infected patients. A detailed preoperative examination and investigations to unmask multisystem disorders caused either by HIV or drugs is essential. Regional anaesthesia is safe but one must take into consideration the presence of local infections, bleeding problems and neuropathies. General anaesthesia is acceptable but drug interactions and multisystem disease caused by HIV should be considered preoperatively.[6]

An ideal anaesthetic agent for short surgical procedures is the one which is able to induce sleep in one brain-arm circulation time and that sleep should be pleasant one.

Etomidate is not a viable option in these patients as there is an inherent risk of adreno-cortical suppression.

Table 1:

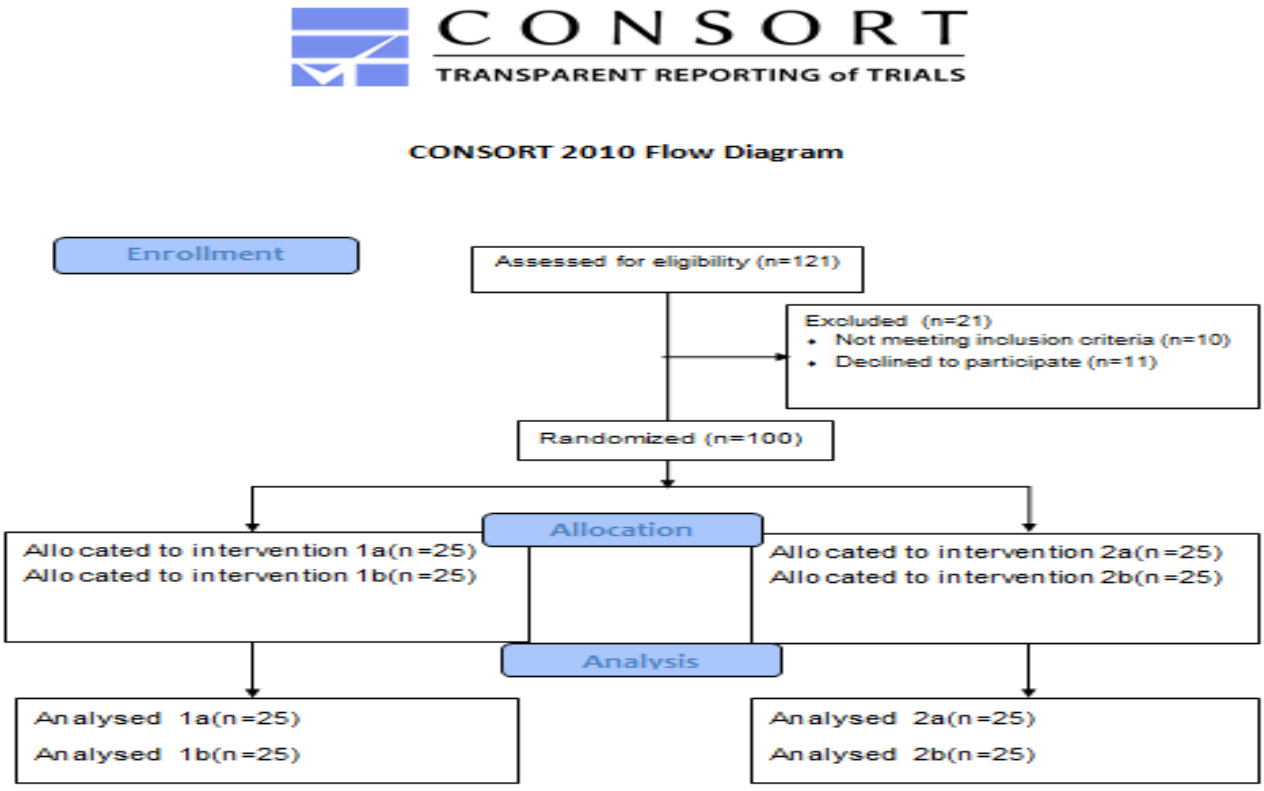

Table 2: Mean Duration of Anaesthesia

Groups	No. of pts	Range	Mean	+SD
1a	25	4-8	6.09	**+/- 1.05**
1b	25	4-12	5.98	+/-1.65
2a	25	4-8	6.04	+/-0.88
2b	25	4-8	5.60	+/-0.99

Duration of anaesthesia was comparable in all groups and statistically non-significant.

Table 3: Comparison of mean induction time (seconds)

Groups	No.of pts	Range	Mean	+/-SD
1a	25	28-32	29.32	+/-1.31
1b	25	27-32	29.98	+/-1.22
2a	25	28-32	28.72	+/-1.72
2b	25	28-32	29.20	+/-1.25

Mean induction time was almost similar in all the 4 groups and on statistical analysis, it was found to be insignificant.

Table 4: Mean BP changes at different time intervals

GROUP	Pre-induction	Induction	Maintenance 2min	4min	6min	8 min
Propofol with premedication 1a	80.08+/-4.06	70.0+/-4.20**	72.96+/-4.58**	75.52+/-4.05**	76.36+/-4.39**	75.91+/-5.08**
Propofol without premedication1b	78.0+/-4.56	68.56+/-4.41**	70.48+/-4.51**	73.12+/-4.54**	73.52+/-4.50**	75.50+/-4.86**
Thiopentone with pre-medication 2a	82.0+/-3.74	75.92+/-3.02**	78.48+/-2.72**	78.24+/-3.07**	78.78+/-2.23**	78.5+/-1.00**
Thiopentone without premedication 2b	81.68+/-3.85	77.12+/-3.87**	77.84+/-3.86**	78.24+/-3.33**	77.91+/-3.75**	78.50+/-1.91**

*-SIGNIFICANT, **-NON- SIGNIFICANT

Table 5: Mean pulse rate changes at different time intervals

Group	Pre-induction	Induction	Maintenance 2min	4min	6min	8 min
Propofol with premedication 1a	85.68+/-5.93	89.84+/-4.93**	86+/-4.47**	85.12+/-4.54**	85.09+/-4.68**	85.42+/-5.38**
Propofol without premedication1b	84.80+/-1.91	88.56+/-2.04**	87.12+/-2.24**	85.04+/-2.38**	84.36+/-2.36	85.50 +/-2.07**
Thiopentone with pre-medication 2a	86.56+/-4.91	93.52+/-5.95**	89.04+/-5.10**	85.92+/-4.52**	85.05+/-4.07**	84.0+/-2.82**
Thiopentone without premedication 2b	84.96+/-4.62	91.48+/-6.98**	87.60+/-7.18**	87.12+/-6.80**	86.92+/-7.0**	88.0+/-8.64**

*-SIGNIFICANT, **-NON- SIGNIFICANT

Table 6: Mean respiratory rate changes at different time intervals

Group	Pre-induction	Induction	Maintenance 2min	4min	6min	8 min
Propofol with premedication 1a	16.16+/-1.28	9.76+/-5.04*	12.16+/-2.37**	14.48+/-1.66**	14.45+/-1.26**	15.71+-1.38**
Propofol without premedication1b	14.88+/-1.22	9.68+/-4.42*	12.44+/-2.33**	13.92+/-1.86*	14.43+/-1.19**	14.85+/-1.06**
Thiopentone with pre-medication 2a	16.96+/-2.13	12.60+/-5.05**	14.32+/-2.67**	15.80+/-2.06**	16.30+/-1.66**	16.50+/-1.91**
Thiopentone without premedication 2b	17.28+/-2.60	13.8+/-4.56**	15.20+/-3.26**	15.76+/-2.78**	15.56+/-2.62**	15.50+/-1.91**

*-SIGNIFICANT, **-NON- SIGNIFICANT

Opiate induction is also not an option in these already immunocompromised patients.

The present study was undertaken to evaluate the usefulness and safety of propofol as i/v anaesthetic agent and to compare it with thiopentone sodium in immunocompromised HIV patients. There is scarcity of literature on anaesthesia induction in immunocompromised patients. Thiopentone is considered safe, as per practice guidelines in many institutions, although documentation of the same is lacking. We hypothesized that propofol could be a good agent for anaesthetic induction of such immunocompromised patients, with lesser or similar drawbacks as thiopentone, but with a better overall efficiency.

We searched extensively on the internet, but due to scarcity of literature on this subject, we could not compare our results with anything substantial. Hence, we discuss our findings in detail in this section.

In the present study, the distribution of patients according to age and weight was comparable in all the groups.

CVS parameters measured were

1. Pulse rate

Thiopentone showed greater rise in pulse rate at induction. In group 1a and 1b there was slight increase in pulse rate at induction which then started declining and became stable after 2 mins and hence forth remained stable. In grp 2a and 2b ,there was also rise in pulse rate at induction which later on started improving towards baseline values. On comparison with in the group, the difference was statistically insignificant.

2. Blood pressure

In our study, average fall in mean BP was more in propofol group (1a and 1b) than thiopentone group. Propofol causes marked peripheral vasodilation. Fall in BP after thiopentone is due to peripheral pooling of blood in capacitance vessels.

Though non-significant, the fall in DBP was more in propofol group than thiopentone group.

3. ECG :There were no cardiac dysrythmias in all 4 groups .

Effect of drugs on Respiratory system :

Changes in respiratory rate and incidence of apnea was evaluated. Changes in oxygen saturation and $EtCO_2$ were also noted.

Propofol showed a greater decrease in respiratory rate with more incidence of apnea. There was significant fall in respiratory rate in group 1a and 1b at induction which was statistically highly significant. In group 2a and 2b, the respiratory rate also showed a fall but returned to baseline earlier than in group 1a and 1b. There was significant incidence of apnea in propofol group than thiopentone group.

In our study, little change in oxygen saturation occurred at induction in all 4 groups.

Induction time: The induction time was almost similar with both thiopentone and propofol. The induction time in group 1a and 1b was 29.32+/-1.31 and 29.92+/-1.22 seconds while it was 28.72+/-1.72 and 29.20+/-1.25 seconds in group 2a and 2b respectively and was found to be statistically non-significant (p value> 0.05).

Recovery

Early recovery is one of the striking features of propofol.

The Steward scoring system is one method of evaluating recovery from anaesthesia by physical evaluation (ventilation, movement and wakefulness).

1. Ventilation score: The mean ventilation score at 3 minutes was 1.20 +/-0.40 and 2.0 in group 1a and 1b whereas it was 1 and 1.68+/-0.47 in group 2a and 2b. On intergroup comparison, (1a and 2a) with (1b and 2b), the ventilation score was found to be highly significant statistically highlighting the effect of pre-medication on ventilation score.

2. Movement score: The mean movement score was 1.14+/-0.20 and 1.84+/-0.37 in group 1a and 1b whereas it was 1.0+/-0 and 1.64+/-0.55 in group 2a and 2b at 3 minutes. This difference was found to be highly significant.

3. Also propofol showed short mean awakening time and shorter time to respond to verbal commands.

Thus, patients who received propofol and nitrous oxide have shown to have a faster recovery by Steward Scale than those given thiopentone.

Complications

Pain on injection was more with propofol while nausea, vomiting, laryngospasm were more with thiopentone. There was a feeling of tiredness observed in many patients who received thiopentone. This could be due to its slow metabolism and slow recovery with the use of thiopentone.

4 | CONCLUSION

The authors conclude that in immunocompromised HIV patients propofol produces rapid, pleasant and safe anaesthesia, along with smooth recovery while thiopentone is associated with poor psychomotor recovery with subjective feeling of tiredness and drowsiness due to its slow metabolism.

Individual contributions of each author to the research and manuscript

LKG- Study design and data collection

A- Patient recruitment and data collection

DB- Compiling results and data analysis

TSK- Data analysis and writing up of the first draft of the manuscript

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