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Comparison of Propofol with Thiopentone for Induction in Day Care Surgery

Mechineni Srivani [1], Vemula Swaroopa [2*]

1. Assistant Professor, Department of Anesthesia, Prathima Institute of Medical Sciences, Naganoor, Karimnagar.
2. Assistant Professor, Department of Anesthesia, Prathima Institute of Medical Sciences, Naganoor, Karimnagar.

Abstract

***Background**: The number of cases of day care surgeries is increasing recently. Propofol and thiopentone are commonly used as induction agents for day care surgeries. We in the current study tried to evaluate the Induction time, hemodynamic response, respiratory effects, and post-operative recovery with both agents in day care surgeries of ASA grade I and II cases. **Methods:** Patients in the age group of 20 and 55 years, both male and females requiring day care surgical procedures were included. The patients were allocated into one of the two groups randomly by a computer-generated randomization chart. Intraoperative and postoperative monitoring was done either by that person or another person, both of whom were unaware of the drug used. Group A (n=30) Thiopentone Sodium 2.5%. Group B (n=30) Propofol 1%. **Results**: The most common cause of seeking day care surgery was due to Hydrocele in 20% of cases, Dysfunctional uterine bleeding (DUB)18.33% followed by fibroadenoma 16.67% cases (table 2). Hydrocelectomy was the most performed day care procedure followed by Dilatation of curettage (D&C) and other procedures done are depicted in table 3. The incidence of pain in group A was reported in 1(3%) cases, the similar incidence in group B was reported in n=5(16.67%) cases. The p-values were not found to be significant. **Conclusion**: propofol 2 mg/kg body weight used intravenously as an induction agent produced a quality of induction similar to that of thiopentone. Concerning the hemodynamic parameters propofol produced more cardiovascular depression and apnoea than thiopentone which is acceptable in healthy patients but limits its usefulness in elderly and sick patients.*

***Keywords**: Propofol, Thiopentone, Induction, Day care surgeries*

Address for correspondence: Dr. Vemula Swaroopa, Assistant Professor, Department of Radiology, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Email: venu.boinapally@gmail.com

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Introduction

Ambulatory surgery has increased rapidly in the past years, and the availability of new minimally invasive surgical techniques has resulted in an increased emphasis on the expansion of day surgery. [1] Day care surgery has been defined by the Royal College of Surgeons as when the surgical day case patient is admitted for investigation or operation on a planned non-resident basis and who nonetheless requires facilities for recovery a patient recovers from surgery and is fit to return to home within a day (24 hrs.) [2] In the earliest days of anesthesia, both nitrous oxide and ether were used for day care surgeries such as outpatient dental extractions. RD Waters (1916) was the first person to open an outpatient anesthesia clinic in Sioux City, Iowa. However, it was not until the economic constraints of the 1970s and 1980's lead to a large increase in outpatient surgeries that the sub-specialty of ambulatory anesthesia for day care surgeries finally emerged. [3] Together with the advancement in surgical techniques has been the availability of newer

and better drugs with short onset and duration of effect, resulting in quick recovery and the possibility of earlier discharge from the day surgical unit. Thiopental was first used in anesthesia almost long ago by Lundy (Lundy 1935). [4] Since that time, thiopental has been established as an intravenous anesthetic drug against which a more recently introduced drug propofol is compared. White (1984), conducted a study on the use of thiopentone for outpatient anesthesia and reported that thiopentone is usually associated with rapid induction of anesthesia without significant side-effects. [5] Propofol (2,6-diisopropyl phenol) is a potent hypnotic drug used intravenously was developed by imperial chemicals London patented by John Glen and Roger James in 1977. [6] Since then achieved widespread acceptance as an intravenous induction agent in day care surgeries because of its attractive features. The study confirmed the potential of propofol as an intravenous anesthetic induction agent. The present study was aimed at comparing hemodynamic responses, side effects associated with anesthetic induction and recovery with Thiopentone and Propofol.

Materials and Methods

This prospective study was conducted for elective day care surgeries in Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Institutional Ethical clearance was obtained for the study. Written consent was obtained from all the patients of the study. Patients in the age group of 20 and 55 years, both male and females of ASA I and ASA II were included in the study. Procedures that were expected to complete within twenty minutes were selected. A total of n=60 patients were studied during the study period.

Inclusion criteria

a) Sex: Male or female
b) Age: 20 to 55 years
c) Anesthetic risk: ASA 1 and ASA II
d) Posted for elective day care surgical procedures.
e) With premedication: Inj Glycopyrrolate 0.2 mg i.v. 10 minutes before induction of anesthesia and Inj Fentanyl 1 mcg/kg immediately after induction.

Exclusion criteria

a) Allergic to any medications till that day.
b) Allergic to egg and soyabean oil.
c) Patients refusal.
d) Patients with a neuropsychiatric disorder.
e) Patients who have difficulty in communicating.

The patients were allocated into one of the two groups randomly by computer-generated randomization chart. Intraoperative and postoperative monitoring was done either by that person or another person, both of whom were unaware of the drug used. Group A (n=30) Thiopentone Sodium 2.5%. Group B (n=30) Propofol 1%. The patients were made comfortable by explaining the procedural formalities in their language. In all the patient's electrocardiography, oxygen saturation, and non-invasive blood pressure were monitored. Intravenous access was secured using an 18 G cannula connected to a three-way connector. Baseline systolic, diastolic, mean blood pressures, heart rate, respiratory rate, oxygen saturation were recorded. Patients in the two groups were premedicated with Inj. glycopyrrolate 0.2 mg i.v., about 10 minutes before the induction and Inj. Fentanyl 1µg/kg immediately after the induction to evaluate pain on injection and oxygenated with a mask. After premedication and oxygenation, depending on the group into which the patients were allocated, the respective drugs were injected intravenously over 30 seconds. Time from starting of injection to loss of eyelash reflex is noted as Induction time. Patients were asked to report any pain on injection, apnoea, if present at the induction, was noted. Apnoea if present patients were ventilated with a bag and mask till the return of spontaneous respirations. Following induction, the blood pressure, heart rate, SpO_2, respiratory rate was recorded. *Maintenance* Nitrous Oxide 66% and Oxygen 33% and 1% of Isoflurane were administered for maintenance of general anesthesia. Patients could breathe spontaneously. Vital parameters-Heart rate, SpO_2, systolic, diastolic and mean blood pressures and respiratory rate, every minute for the first five minutes and later every five minutes was recorded. Time at the beginning of instrumentation and thus the duration of instrumentation was noted. *Recovery* Time noted at a stoppage of instrumentation. At the

end of the surgery inhalation agents were stopped and 100% O_2 was administered. Recovery characters were noted using Modified Aldrete's Score. [7] Postoperative nausea, vomiting, shivering if any were also noted. Postoperative nausea and vomiting were treated with Inj. Ondansetron 4 mg. Shivering if present was treated with oxygen alone and the patients who did not respond to this were treated with oxygen and Inj. Tramadol 25mg. After recovery patients were shifted to the post-operative ward for further observation.

Results

An analysis of various demographic parameters was done between both groups to find any significant deviation between the group about any parameters. The p-values obtained from all the comparisons were found to be >0.05 hence the groups were having a homogeneous distribution of cases (table 1). The distribution of cases to ASA grading in either group was also comparable.

Table 1: Demographic Parameters

Demographic Parameter	*Groups*	*N*	*Mean*	*Standard Deviation*	*P-Value*
Age	A (Thiopentone)	30	35.53	10.477	0.708
	B (Propofol)	30	39.33	10.267	
Weight	A (Thiopentone)	30	57.63	6.713	0.55
	B (Propofol)	30	58.23	9.126	
Duration of procedure	A (Thiopentone)	30	15.53	2.596	0.337
	B (Propofol)	30	15.37	2.141	
Duration of induction	A(Thiopentone)	30	36.77	4.023	0.414
	B (Propofol)	30	35.27	3.685	

The most common cause of seeking day care surgery was due to Hydrocele in 20% of cases, Dysfunctional uterine bleeding (DUB) 18.33% followed by fibroadenoma 16.67% cases (table 2). Hydrocelectomy was the most performed day care procedure followed by Dilatation of curettage (D&C) and other procedures done are depicted in table 3. The incidence of pain in group A was reported in 1(3%) cases, the similar incidence in group B was reported in n=5(16.67%) cases. The p-values were not found to be significant.

The systolic blood pressures between both groups were measured from starting 0 minutes to 20 minutes. The fall in systolic blood pressure was greater in group B as compared to group A with p-values 0.05 at intervals of 1 and 2 minutes. However, at the other intervals, the values of fall of SBP remained the same in both groups (figure 1). Similar observations for diastolic blood pressure in both groups did not reveal any significant changes between both groups (Figure 2).

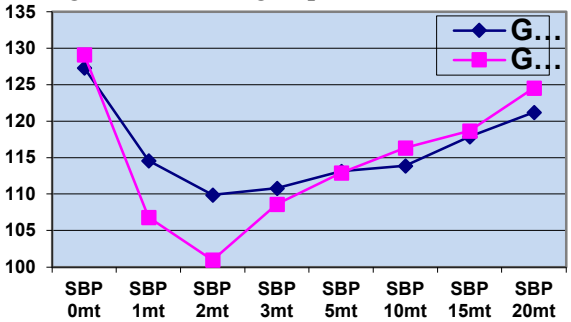
Table 2: Distribution of Cases

Diagnosis	*Group A*	*Group B*	*Total*	*Percentage*
Lipoma	4	1	5	8.33
Sterilization	3	3	6	10.0
DUB	5	6	11	18.33
Hydrocele	6	6	12	20.0
Ganglion	1	1	2	3.33
Fibroadenoma	5	5	10	16.67
Varicocele	1	1	2	3.33
Sebaceous cyst	2	2	4	6.66
Phimosis	3	4	7	11.67
Bartholin cyst	0	1	1	1.67
Total	30	30	60	100

Table 3: Distribution of Procedures

Procedures	*Group A*	*Group B*	*Total*
Excision	7 (23.33%)	4 (13.33%)	11
Lumpectomy	5 (16.66%)	5 (16.66%)	10
D&C	5 (16.66%)	6 (20%)	11
Hydrocelectomy	6 (20%)	6 (20%)	12
Circumcision	3 (10%)	4 (13.33%)	7
Varicocelectomy	1 (3%)	1 (3%)	2
Marsupialization	-	1 (3%)	1
Tubectomy	2 (6%)	1 (3%)	3
Vasectomy	1 (3%)	2 (6%)	3
Total	30	30	60

Figure 1: Fall in systolic blood pressure in mmHg between both groups



The heart rate was higher in the thiopentone group when compared to the propofol group and it was statistically significant in 2 and 3 minutes. There was a slight fall in the oxygen saturation in the first 3 minutes after induction in the thiopentone group, but it was not statistically significant. Post-operative recovery was assessed by a modified Aldrete scoring system which consists of five parameters like activity, color, consciousness, respiration, circulation. [7] The scores for activity were low in the

thiopentone group when compared to the propofol group and it was statistically significant. There was not much difference in the scores for respiration in both groups. Circulatory changes in the two groups were not statistically significantly different. The Time taken for recovery of consciousness in the thiopentone group was longer when compared to the propofol group. The lower scores for consciousness in the thiopentone group were statistically significant. There was no significant variation in color of both groups. The total recovery score was higher in the propofol group and it was statistically significant at 5,10 and 15 minutes (Table 4)

Figure 2: the fall in diastolic blood pressure in mmHg between both groups

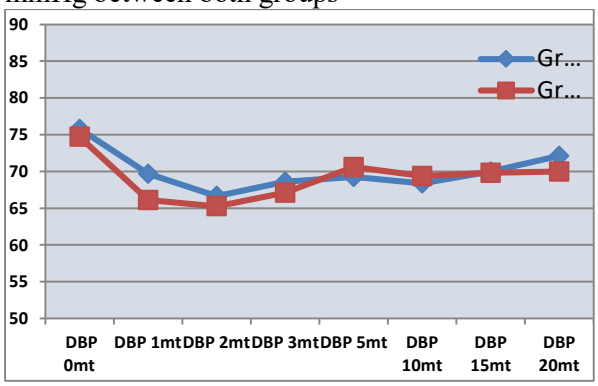


Table 4: Total Recovery Score

	Group A Mean ± SD		*Group B Mean ± SD*		*P-Value*
0 mt	10.00	0.00	10.00	0.00	_
5 mt	9.10	0.89	9.83	0.53	0.008
10 mt	9.50	0.62	10.00	0.00	0.000
15 mt	9.77	0.43	10.00	0.00	0.005

The incidence of apnoea was higher in the propofol group, but it was not statistically significant. Thiopentone group had a higher incidence of shivering in comparison to the propofol group but was not statistically significant. The incidence of nausea was high in the thiopentone group and it was statistically significant. The incidence of vomiting was also higher in the thiopentone group when compared to the propofol group.

Discussion

There has been a large increase in day care surgeries worldwide because of several advantages. One of the important advantages is faster recovery and early ambulation. The study aimed exclusively to evaluate and compare the effects of 1% Propofol and 2.5%Thiopentone. The cases randomly selected for the study were all comparable to the distribution of causes, diagnosis, procedure executed, and the duration of the procedure. The dosage of the drugs required was 2 mg/kg in propofol and 4 mg /kg in the thiopentone group for the loss of eyelash reflex '*equipotent dosage'*, following Gerald Edelist. This suggests that propofol is nearly *twice* as potent as that of thiopentone. [8] Pain on injection an important unwanted effect was highest in Propofol group (16.6%) and thiopentone group had an incidence of (3.3%). Fahy et al; made a comparison of induction characteristics of propofol with thiopentone. It was found that propofol is a safe and satisfactory induction agent in healthy patients but caused a higher incidence of pain on injection and significantly greater fall in blood pressure than with thiopentone. [9] Lee et.al in their double-blind controlled study has concluded that thiopentone was more effective than lignocaine in reducing the pain on injection of propofol with a p-value < 0.03. [10] Strategies to reduce the incidence of pain on the injection of propofol included large vein cooling the solution before injecting. [11, 12] pre-treatment or mixing with lignocaine and prior administration of saline, aspiration of blood, pre-treatment with aspirin and opiates. [10, 13] Johnston et al; [14] conducted a study on propofol versus thiopentone for outpatient anesthesia and observed that there was a higher incidence of apnoea, pain on injection, and spontaneous movements in the propofol group. The basal hemodynamic parameters of the two groups were comparable. After induction, the first, second-and third-minute systolic pressures in the propofol group (Group B) were low which differed from the thiopentone group. The second-minute readings in the two groups significantly differed from the baseline readings. The systolic pressures at the first- and second-minutes post-induction were significant statistically in the propofol group, but it was clinically acceptable. The diastolic pressures were also low in the propofol group when compared with the thiopentone group. The mean pressures were also below the baseline in the propofol group. These low mean arterial pressures were statistically significant at a second minute after induction. The results are consistent with that of Grounds RM et al; [14]

found similar observations with thiopentone at the end of 2 minutes. Propofol is known to decrease systemic blood pressure greater than those evoked by comparative doses of thiopentone. Propofol causes relaxation of the vascular smooth muscle. It is primarily due to inhibition of sympathetic vasoconstrictor activity. A negative ionotropic effect of propofol is primarily due to inhibition of trans- sarcolemmal calcium influx. [15] The changes in the oxygen saturation as monitored by the SpO_2 were not significantly different clinically and statistically in both the study groups. The incidence of apnoea for a short duration was higher in the propofol group when compared with the other group. None of the drugs produced a respiratory depression of clinical significance and all the patients returned to spontaneous ventilation by the bag and mask ventilation. For assessing the recovery characteristics all the patients were monitored in the recovery room for twenty minutes. Recovery from anesthesia can be quantified in many ways. We used modified Aldrete's scoring system to quantify the recovery. The patients in the study groups were fit to be discharged from the recovery room at 15 minutes. The recovery scores for consciousness had a similar trend as that of the activity. But the conscious levels improved at 10-minutes in the thiopentone group. The total recovery scores were also low with the thiopentone group Propofol is superior to thiopentone in this respect. [16]

Conclusion

Based on the results of the present study propofol 2 mg/kg body weight used intravenously as an induction agent produced a quality of induction similar to that of thiopentone. Regarding the hemodynamic parameters, propofol produced more cardiovascular depression and apnoea than thiopentone which is acceptable in healthy patients but limits its usefulness in elderly and sick patients. propofol produces a faster recovery from anesthesia with fewer post-operative sequelae and more superior quality of recovery than thiopentone. Propofol is costlier than thiopentone which may limit its usefulness. However, propofol is associated with faster recovery and early discharge which may reduce the economic burden of the patient to some extent.

Conflict of Interest: *None declared*
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