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Research Paper

A comparative study of induction and recovery characteristics with Propofol and Halothane or Sevoflurane in Adult Day Case Surgeries

Medical Science

KEYWORDS : Propofol, Sevoflurane, day case anaesthesia, Recovery

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ABSTRACT

Introduction : For day case surgery to be effective, morbidity must be minimized. The choice of anaesthetic agent and technique is critical. Sevoflurane or propofol may be ideal agents owing to smooth, rapid induction and emergence and less PONV. This study aimed to compare these properties and adverse effects of sevoflurane and propofol.

Material and Method

Prospective study on 100 patients of ASA I or II, aged 18 to 70 years, scheduled for elective day case surgeries under general anaesthesia. Patients assigned randomly to one of two study groups: Group P/H, i.v. propofol (with lidocaine) induction and halothane/nitrous oxide maintenance; and Group S, sevoflurane/nitrous oxide induction and maintenance.

Results

Sevoflurane was associated with higher PONV than propofol/halothane, more adverse events during induction and agitation and distress in recovery.

INTRODUCTION

Day case surgery is now on the increasing trend, due to patient preference and health-care cost pressures, to minimize hospital stay in elective surgeries. Ideally, this should be without its own problems, such as the incidence of pain and post-operative nausea and vomiting (PONV). [2,3] To realize this ideal, we have to tailor anaesthetic agent and procedure carefully. Older inhaled gases like Halothane have been used for long, and are recently being replaced by intravenous propofol and inhaled sevoflurane in this setting. [1,4]

Sevoflurane has been touted as an ideal inhaled gas - owing to low blood gas solubility, pleasant odour and fast induction and recovery; it might hence be ideal for day cases as well. Propofol also gives a smooth induction, fast emergence and anti-emetic activity. Hence this study, comparing these two agents in the day case setting in India.

AIM:

To study the induction and recovery characteristics of sevoflurane in inhalational induction and maintenance versus intravenous induction by propofol and maintenance by halothane in 100 adult patients undergoing elective day case general surgical procedures.

OBJECTIVES:

1. To study the mean induction and maintenance anaesthetic times, recovery and discharge times associated with sevoflurane induction and maintenance versus propofol induction and halothane maintenance.
2. To study any adverse events on induction or post-operative nausea and vomiting.

MATERIALS AND METHODS

This prospective study was done in Kasturba Medical College Hospitals and Government Wenlock Hospital, Mangalore. Ethics Committee approval and written informed consent from patients were obtained. ASA class 1 and 2 patients aged 18 to 70 years undergoing short surgical day care procedures were included in the study.

Exclusion criteria were a history of allergic or other serious adverse experience with anaesthesia; severe respiratory, metabolic and central nervous system disease, hepatic disease, significant cardiac disease or anticipated airway management problems.

METHOD

100 patients were assigned randomly to one of two study groups: Group P/H, IV propofol (with lidocaine) induction and halothane/nitrous oxide maintenance; and Group S, sevoflurane/nitrous oxide induction and maintenance.

A computer-generated random number sequence was used to determine allocation to study groups. All patients were put on routine monitoring, which consisted of electrocardiogram, automated blood pressure and pulse oximetry. Gas monitoring consisted of inspired and expired oxygen, carbon dioxide and volatile agent concentration.

Because of the obvious differences in the induction techniques, it was not possible to blind the anaesthesiologists to the treatment allocation. The data analysts were masked to treatment allocation until after the analysis of trial results.

The doses of anaesthetic induction and maintenance drugs, airway control were at the discretion of the individual anaesthetist, within the constraints of the agent randomization. The fresh gas flow was fixed at 70±100 ml/kg/min via a closed circuit delivery system. All patients received between 50 and 70% nitrous oxide with oxygen during maintenance. Analgesia was with fentanyl IV. Prophylactic antiemetics were not permitted to assess PONV.

Group P/H (n=50)

After premedication, induction was by IV propofol in a dose of 3 mg/kg body weight, in graded titrated boluses. Airway was secured, and maintenance of anaesthesia was continued by inhalational agent halothane along with oxygen nitrous oxide.

GROUP S (N=50)

After appropriate premedication, induction was by sevoflurane in a concentration of 8% initially titrated further according to patient response, with patient inhaling normal tidal volume breaths. After induction airway was secured and maintenance was with sevoflurane 1-2% along with oxygen-nitrous oxide.

Data collection was prospective. The patients' age, sex, and type of surgery were recorded. The time taken for anaesthetic induction, maintenance, recovery and time to discharge were noted. The patients were shifted out from the recovery room when

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fully awake, able to maintain their airway patency and obeying commands. When the patient was ambulant, able to take fluids and had no pain or vomiting, he was discharged home. PONV was the primary outcome measure; this was scored in both the recovery room and in the postoperative ward, using the following scale:

0=absence,
1=nausea only,
2=one emetic episode, and
3=multiple emetic episodes
The incidences of adverse events during induction are noted:
1-pain on injection,
2- excitatory movement,
3-laryngospasm,
4- coughing.

After surgery, in the recovery room the patient's mental state was assessed by assigning one of three phrases to best describe mental state in recovery:

1- `alert and awake',
2-`drowsy',
3- `agitated and distressed'.
The number of patients admitted for overnight stay were recorded.

RESULTS
Statistical analysis was performed using unpaired student t test, chi square test and Fishers exact test. A p value <0.05 was considered to be statistically significant. The various parameters studied were:

The mean age of patients in group P/H was 39.26 and in group S was 37.57 (p=0.467); there was no statistically significant difference in age between the two study groups (table 1)

The duration of surgery was comparable between the two groups, in group P/H mean time was 28.0 minutes and group S it was 26.1 minutes (p=0.34) (table3).

Mean time taken for induction in P/H group was 2.79 minutes, as compared to the other group S in which it was 3.73, with a p value of 0.01 (table 4)

The mean recovery time in group P/H 24.24 minutes while in group S was 21.93 minutes with p=0.05, this indicates faster recovery times with sevoflurane. (table5)

The discharge time was more in P/H group due to one or more factors compared to sevoflurane group (mean time in Group S was 490 vs 516 in Group P/H), but this was statistically insignificant (p=0.229) (table5)

Pain on administration was exclusively limited to propofol induction, out of 50 patients 14 patients complained of pain while injecting the drug IV, even after addition of lignocaine.

ADVERSE EVENTS DURING INDUCTION:
The excitatory movements was more common in group S, as compared to propofol.

Incidence of laryngospasm was found in about 4 patients in sevoflurane group, while no such event was found in patients induced with propofol.(p=0.041) (table 2)

Cough on induction was associated commonly in sevoflurane inhalation induction (14 vs 3) (p=0.03) versus nil in other group.

(table 3)
RECOVERY CHARACTERISTICS:
In sevoflurane group during recovery almost all patients were fully awake and alert, while in P/H group only 33 patients out of 50 were alert (p<0.01) and 19 patients were drowsy. (Table 4)

The incidence of nausea and vomiting was slightly more common in sevoflurane group (10 vs 7), but the difference was statistically insignificant.(p=0.424)

During recovery period, agitation was more in sevoflurane group compared with P/H group (9 vs 2),(p=0.025) (table 5)

6 patients had an episode of vomiting in early recovery period in sevoflurane group as compared to 3 patients in group P/H (p=0.295),(statistically insignificant). 2 patients had an episode of vomiting in postoperative ward in group S vs nil in other group.

Table 1: Time to Discharge

Group Statistics

	GROUP	N	Mean	Std. Deviation	t
Recovery time	Group I	50	21.9320	5.56881	1.97500
	Group II	50	24.2400	6.10640	p=0.05 sig
discharge time	Group I	50	490.0000	108.21370	1.21200
	Group II	50	516.0000	106.36863	p=0.229 ns

Table 2: Incidence of laryngospasm during induction

LARYNGOSPASM

		GROUP		
		Group I	Group II	Total
NONE	Count	46	50	96
	% P	92.0%	100.0%	96.0%
Yes	Count	4	0	4
	% P	8.0%	.0%	4.0%
Total	Count	50	50	100
	% P	100.0%	100.0%	100.0%

a. x2=4.167 p=0.041 sig

Table 3: Cough on induction

COUGH

		GROUP		
		Group I	Group II	Total
NONE	Count	36	47	83
	%	72.0%	94.0%	83.0%
YES	Count	14	3	17
	%	28.0%	6.0%	17.0%
Total	Count	50	50	100
	%	100.0%	100.0%	100.0%

a. x2=8.576 p=.003 hs

Table 4: Alertness in recovery room

ALERT AND AWAKE

		GROUP		
		Group I	Group II	Total
NO	Count	0	17	17
	%	.0%	34.0%	17.0%
YES	Count	50	33	83
	%	100.0%	66.0%	83.0%
Total	Count	50	50	100
	%	100.0%	100.0%	100.0%

a. X2=20.482 p<.001 vhs

Table 5: Post-operative agitation and distress

POST OP AGITATION / DISTRESS

			GROUP		
			Group I	Group II	Total
Agitated distressed	NO	Count	41	48	89
		%	82.0%	96.0%	89.0%
	YES	Count	9	2	11
		%	18.0%	4.0%	11.0%
Total		Count	50	50	100
		%	100.0%	100.0%	100.0%

a. X2=5.005 p=0.025 sig

DISCUSSION
This study compared both quantitative and qualitative measures of induction.

Induction was more rapid and smooth with propofol than sevoflurane. Excitatory movement was a common adverse event dur-

ing induction with inhaled sevoflurane, probably due to longer time spent in excitation phase during sevoflurane induction.

14 patients described pain on IV induction with propofol despite the use of lidocaine. This was the only negative aspect of propofol induction. The longer time for induction in the sevoflurane group was statistically greater.

Distress during emergence in the recovery room had a higher incidence in the sevoflurane group.

In the study, the incidence of PONV was higher in the sevoflurane group than in the propofol/halothane group, measured both in the recovery room and in the postoperative ward, although this difference was not significant statistically.

CONCLUSION

The sevoflurane regimen was associated with higher rates of PONV than propofol/halothane, a higher incidence of adverse events during induction and agitation and distress in recovery. A reduction in time required in the postoperative recovery room in the sevoflurane group did not translate into a shorter hospital stay.

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