ORIGINAL ARTICLE

COMPARISON OF RECOVERY PROFILE AFTER THE USE OF DESFLURANE, SEVOFLURANE AND PROPOFOL IN DAY CARE LAPROSCOPIC SURGERIES

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ABSTRACT

Objective: The study was conducted to compare the use of less soluble volatile anesthetics (Desflurane and Sevoflurane) as alternatives to Propofol for maintenance of general anesthesia in providing a more rapid emergence from anesthesia.

Methodology: For the study 90 cases of ASA 1 and 2 physical status scheduled for laparoscopic surgery were randomly divided to one of three anesthetic groups by the chit method. Total 90 adult patients of ASA I and II between the age group of 18 – 70years of either sex posted for elective daycare laparoscopic were selected for the study. They were randomly divided into three groups Group 1 received Desflurane, Group 2 received Propofol and Group 3 received Sevoflurane.

Results: There were total 30 patients in each group. In group of Desflurane and group of Sevoflurane least fall in blood pressure than group of Propofol. So Propofol causes maximum fall in blood pressure as compare to Desflurane and Sevoflurane. Following to vaporizer turn off the immediate recovery is seen in Desflurane group of patient. While delayed eye opening seen in Propofol group of patient and intermediate eye opening seen in Sevoflurane group.

Conclusion: Desflurane provides faster recovery from anesthesia in patients undergoing laparoscopic surgeries than Sevoflurane and Propofol. However all three groups were hemodynamically stable during the intraoperative period.

Keywords: Propofol, Desflurane, Sevoflurane, fast track eligibility score

INTRODUCTION

The number and variety of procedures done laparoscopically has rapidly increased in the past 15 years. Availability of a variety of surgical techniques which are minimally invasive has resulted in increased emphasis on expansion of day care surgeries. For day care anesthesia applications the use of anesthetics that provide fast and smooth induction allow quick changes in depth while maintaining anesthesia, early recovery, less post operative nausea and vomiting, less pain and good fast track eligibility score are recommended. Given the low blood gas partition coefficient of Sevoflurane (0.69) and Desflurane (0.42) a more rapid emergence from anesthesia is expected compared with traditional inhalational agents like Isoflurane.[1]

Considering these characteristics, for fast induction and early recovery based on low blood/gas partition coefficients, new inhalation agents are being used as alternatives to Propofol in day-case anesthetic applications. Despite that there are many comparative studies with Propofol and inhalation agents, for the effects of PONV and on recovery criteria there aren't much with Desflurane, Sevoflurane and Propofol. In this study, the effects of Desflurane, Sevoflurane and Propofol, as frequently used agents in day-care surgery, on recovery in laparoscopic surgeries has been comparatively investigated.

AIMS & OBJECTIVE

The objective of the study was to compare the use of less soluble volatile anesthetics (Desflurane and Sevoflurane) as alternatives to Propofol for maintenance of general anesthesia in providing a more rapid emergence from anesthesia with respect to intra operative hemodynamics, time for spontaneous respiration, time for eye opening, time of seat and walk, in patients undergoing day-care laparoscopic surgeries.

METHODOLOGY

For the study, after permission of institutional ethical committee, 90 cases of ASA 1 and 2 physical status scheduled for laparoscopic surgery in Sterling Hospital, Ahmedabad, Gujarat were randomly divided to one of three anesthetic groups by the chit method.

Patients in the age group 20 to 70 years; ASA 1 and ASA 2 patients; and patients willing to give informed written consent were included in the study.

Patients with clinically significant cardiovascular, respiratory, hepatic, renal, neurologic, psychiatric or metabolic disease; pregnant women; cases with morbid obesity; those with a history of alcohol and drug abuse; and patients not willing to give consent were excluded from the study.

Total 90 envelopes with equal representation of all 3 groups were made. General anesthesia was induced with IV midazolam 0.03mg/kg, Propofol 1.5-2.5mg/kg, Fentanyl 2μg/kg and Ondansetron 4mg. Laryngoscopy and tracheal intubation was facilitated with Rocuronium 0.09mg/kg.

Patients were explained regarding study in detail and after obtaining written consent in the presence of one witness, they had given bowl of chit to select the group randomly. This chit was collected by observer and selected drug was given after proper care to administrator in closed enveloped without label.

Anesthesia was maintained initially with either Desflurane 3%(group 1), Sevoflurane 1- 2%(group 2), or Propofol 100 μg/kg/min (group 3) in combination with N2O 60% in O2.Concentration of maintenance anesthetic varied to maintain hemodynamic variables within 15% of pre induction values i.e. Desflurane 2-6%, Sevoflurane 0.6-1.75% and Propofol 50-150 μg/kg/min.All patients were mechanically ventilated to maintain end tidal CO2 within 27-32 mm of mercury.

In all cases, Desflurane, Sevoflurane and Propofol was discontinued when the laparoscope was removed. The N2O was continued till the last suture. To minimize the risk of residual neuromuscular blockade after surgery, reversal of neuromuscular blockade was provided by Neostigmine 50μg/kg and Glycopyrrolate 8μg/kg.

Time for spontaneous breathing, eye opening, and extubation were measured from time of termination of anesthetic gas or Propofol infusion.

All results were recorded in data collection sheet and data was entered and analysed using Microsoft excel.

RESULTS

Total 90 adult patients of ASA I and II between the age group of 18 – 70years of either sex posted for elective daycare laparoscopic were selected for the study. They were randomly divided into three groups Group 1 received Desflurane, Group 2 received Propofol and Group 3 received Sevoflurane.

There were total 30 patients in each group. Table 1 shows gender wise distribution of patients.

Table 1: Comparison of Gender distribution of patients studied gender

Sex	Desflurane	Propofol	Sevoflurane
Male	16	14	16
Female	14	16	14
Total	30	30	30

Table 2: Comparison of Hemodynamic profile between three groups of patients studied

Profile	Desflurane	Propofol	Sevoflurane
Pulse			
0 min	75.3+/-3.6	75.03+/-3.5	73.8+/-3.1
15 min	83.0+/-6.8	82.33+/-7.7	84.2+/-6.02
30 min	75.7+/-5.03	75.13+/-4.6	76.86+/-4.09
45 min	66.8+/-5.04	67.13+/-3.66	69.6+/-4.2
60 min	66.3+/-4.7	65.53+/-5.08	69.2+/-3.6
Systolic blood pressure			
0 min	135.9+/-12.08	141.0+/-15.6	137.4+/-12.37
15 min	117.9+/-6.69	107.4+/-8.6	119+/-14.3
30 min	121.5+/-8.9	119.2+/-8.6	117+/-10.34
45 min	126.9+/-9.1	127+/-8.9	124.6+/-9.1
60 min	131.4+/-7.5	132.8+/-9.7	130.5+/-9.7
Diastolic blood pressure			
0 min	76.2+/-7.9	76.8+/-8.9	76.0+/-8.3
15 min	67.3+/-5.7	59.9+/-5.6	68.8+/-8.1
30 min	71.6+/-7.1	67.2+/-7.1	69.1+/-7.9
45 min	72.7+/-7.5	71.1+/-6.4	71.5+/-8.0
60 min	74.5+/-5.9	74.2+/-5.6	73.4+/-8.4
Spo2			
0 min	97.93+/-.78	98.16+/-0.79	98.0+/-0.83
15 min	97.83+/-1.2	98.0+/-1.1	97.94+/-1.1
30 min	97.9+/-0.92	98.1+/-0.98	97.84+/-1.0
45 min	98.03+/-1.1	98.06+/-1.2	98.06+/-0.9
60 min	97.93+/-1.1	97.96+/-1.1	98.1+/-1.1
EtCO2			
0 min	32.9+/-2.0	33.4+/-1.8	32.8+/-1.3
15 min	28.9+/-2.9	28.2+/-2.2	29.0+/-1.8
30 min	27+/-2.7	26.9+/-2.5	26.9+/-1.9
45 min	27.1+/-3.0	27.2+/-2.7	27.5+/-2.3
60 min	27.4+/-2.9	27.0+/-2.3	27.0+/-2.2

Table 2 shows that after induction of anesthesia blood pressure falls in all three group. But in group of Desflurane and group of Sevoflurane least fall in blood pressure than group of Propofol. So Propofol causes maximum fall in blood pressure as compare to Desflurane and Sevoflurane.

All the three groups of study have shown that there is not more than 1% fluctuation in oxygen saturation by pulse oxymetry. Maximum stabilization has been seen with Propofol as compare to Desflurane and Sevoflurane.

Table 3: Comparison of eye opening as early recovery between three groups of patients studied

Eye opening (mins)	Desflurane	Propofol	Sevoflurane
1	14	0	1
2	15	0	5
3	1	0	7
4	0	0	11
5	0	0	4
6	0	0	2
7	0	8	0
8	0	14	0
9	0	8	0

Table 4: Comparison of time to walk as late recovery between three groups of patients studied

Time to walk (hrs)	Desflurane	Propofol	Sevoflurane
3	0	0	1
4	0	0	2
5	17	0	4
6	12	0	8
7	1	1	7
8	0	2	6
9	0	10	2
10	0	14	0
11	0	3	0

Table 3 suggests that following to vaporizer turn off the immediate recovery is seen in Desflurane group of patient. While delayed eye opening seen in Propofol group of patient and intermediate eye opening seen in Sevoflurane group.

In late recovery criteria early walking are seen in Desflurane while it was delayed with Propofol and intermittent with Sevoflurane.

DISCUSSION

In our study hemodynamic variables (heart rate, systolic BP and diastolic BP) were maintained within ±15% of baseline values in Desflurane and Sevoflurane group, in Propofol group maintain within +/- 30% adjusting the maintenance anesthetic concentration. Concentration of Desflurane varied between 2-7%, Sevoflurane 1-3.5% and Propofol infusion 60-150µg/kg/min. Intra operative analgesia was provided with supplemental doses of fentanyl (0.3µg/kg/hr) in all the three groups.

Gulcan Berkel[2] et al in their study to compare hemodynamic parameters and recovery characteristics between Desflurane and Sevoflurane in patients undergoing laparoscopic surgeries concluded that both Desflurane and Sevoflurane maintains hemodynamic stability during the intraoperative period. They also found that early recovery is rapid in Desflurane group.

Time taken for eye opening: Time for eye opening in Desflurane, Propofol and Sevoflurane groups were 1.5+/-0.58, 8.0+/-0.74 and 3.6+/-1.20 minutes respectively. It is significantly shorter in Desflurane group ($p < 0.001$).

In our study the Desflurane group took significantly shorter time for extubation when compared with the other two groups.

Gulcan Erk et al[3] compared the effects of Desflurane, Sevoflurane and Propofol on recovery characteristics and PONV in laparoscopic surgeries. They found that extubation and eye opening times (early recovery) were meaningfully lower in Desflurane group and no significant differences were observed in orientation, sitting and walking times (delayed recovery). In our study also the Desflurane group had shorter early recovery times.

Dajun Song[4] et al found that compared with the Propofol group, the times to awakening and to achieve a recovery score of 10 were significantly shorter, and the percentage of patients judged fast-track eligible on arrival in the PACU was significantly higher, in the Desflurane and Sevoflurane groups (90% and 75% vs 26%)after laparoscopic tubal ligation surgery. They concluded that compared with Propofol, Desflurane and Sevoflurane resulted in a higher percentage of outpatients being judged eligible for fast tracking.

Jeffrey L. Apfelbaum, MD[5] et al in a study to compare post anesthetic and residual recovery of Desflurane versus Propofol anesthesia found that awakening and early psychomotor recovery for as long as 1 h after anesthesia is faster after Desflurane than after Propofol, but there was no difference in time to home readiness or in residual effects thereafter between Propofol and Desflurane with N2O in O2.

S. Gergin et al[6] in a comparative study of hemodynamic, emergence and recovery characteristics of Sevoflurane with those of Desflurane in nitrous oxide anesthesia found that time to extubation, recall of name and handgrip on command were shorter in the Desflurane group ($p<0.01$) and concluded that Desflurane offers a transient advantage compared with Sevoflurane with respect to early recovery although the duration of anesthesia was longer in the Desflurane group.

Philippe Juvin, MD et al[7] compared postoperative recovery for 36 obese patients randomized to receive either Desflurane, Propofol, or Isoflurane to maintain anesthesia during laparoscopic gastroplasties and found that immediate recovery occurred faster, and was more consistent, after Desflurane than after Propofol or Isoflurane. They concluded that in morbidly obese patients, postoperative immediate and intermediate recoveries are more rapid after Desflurane than after Propofol or Isoflurane anesthesia.

Michael H. Nathanson et al[8] compared the recovery characteristics of Desflurane and Sevoflurane when used for maintenance of ambulatory anesthesia. They concluded that use of Desflurane led to a more rapid emergence and shorter time to extubation compared to Sevoflurane.

Edmond I Eger II[1] in their study documented the differences in kinetics of 2 h and 4 h of 1.25 minimum alveolar anesthetic concentration (MAC) of Desflurane (9.0%) versus (on a separate occasion) Sevoflurane (3.0%), both administered in a fresh gas inflow of 2 L/min.They concluded that regardless of the duration of anesthesia, elimination is faster and recovery is quicker for the inhaled anesthetic Desflurane than for the inhaled anesthetic Sevoflurane.

M. Bock et al[9] studied the potency and recovery characteristics of Rocuronium during 1.25 MAC of Isoflurane, Desflurane, and Sevoflurane or Propofol anesthesia in 84 patients using electromyography. They found that there were no significant differences between the three potent inhalation anaesthetics in relation to potency, infusion requirements or recovery characteristics of Rocuronium.

Time taken to seat and walk: In our study Desflurane took significant less time to seat and walk, Sevoflurane take more time to seat and walk compare to Desflurane but less time than Propofol. Time to seat for Desflurane, Sevoflurane and Propofol are 3.5+/-0.57, 3.7+/-1.1 and 7.6+/-0.8, respectively (p=0.001). Time to walk for Desflurane, Sevoflurane and Propofol are 5.7+/-0.57,9.5+/-0.89 and 6.7+/-1.4, respectively (p=0.00). So Propofol took delayed recovery from anesthesia as compared to Desflurane and Sevoflurane.

CONCLUSION

Desflurane provides faster recovery from anesthesia in patients undergoing laparoscopic surgeries than Sevoflurane and Propofol. However all three groups were hemodynamically stable during the intraoperative period.

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