



COMPARISON OF EMERGENCE AND RECOVERY CHARACTERISTICS OF SEVOFLURANE AND DESFLURANE FOR GYNAECOLOGICAL DAY CARE LAPAROSCOPIC SURGERY

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ABSTRACT

Background and Aims :-Ambulatory anaesthesia provides benefits to not only the patients but also the healthcare providers and hospitals. Inhaled anaesthetics allow rapid emergence from anaesthesia.

With the availability of newer less soluble inhalation anaesthetics, we planned this prospective randomised study to compare the emergence and recovery characteristics of sevoflurane and desflurane for outpatient gynaecological laparoscopic surgeries.

Material and methods :-ASA 1,2 patients, undergoing gynaecological day care laparoscopic surgeries were randomly assigned to receive desflurane (n= 25) or sevoflurane (n=25) after induction with intravenous propofol (2mg/kg), emergence and recovery characteristics, perioperative hemodynamics and adverse events were recorded. Data were analysed using SPSS, version 21 for windows statistical software package. $P < 0.05$ was considered statistically significant.

Results:-Demographic data, perioperative haemodynamics, duration of surgery were comparable between both the groups. Emergence and early recovery was significantly shorter in the Desflurane group as compared to Sevoflurane group ((5.89±1.77 min. versus 15.68±4.52 min, $p < 0.05$). A significantly higher mean modified aldrete score was seen at 10 minutes (9.07±0.27 versus 8.04±0.78) in Desflurane group but late recovery assessed by next day activity score was comparable in both the groups ($p > 0.05$)

Conclusion:-Desflurane provides faster emergence and recovery in comparison to sevoflurane but despite a faster wake up time with desflurane, time to home readiness is similar in both the group.

KEYWORDS : Desflurane, Day care surgery, Emergence

INTRODUCTION

Day care surgery has many advantages to patient and hospital. They include minimal psychological disturbances for the patient, is economical with reduced requirement of nursing and medical supervision and hospital services allowing more number of patients to be treated and finally consequent reduction in the risk of hospital-acquired infection and venous thromboembolism.

Ambulatory anaesthesia is administered with the dual goals of rapidly and safely establishing satisfactory condition for the performance of therapeutic or diagnostic procedures while ensuring rapid, predictable recovery with minimal postoperative sequel (2). One of the major factors that determine speed of recovery from anaesthesia is the choice of anaesthetic technique. Many techniques are used for this.

Inhaled anaesthetics allow rapid emergence from anaesthesia because of easy titrability with inherent neuromuscular blocking effects that make them more suitable for ambulatory anaesthesia. Less soluble inhalation anaesthetics such as sevoflurane and desflurane have shorter emergence times compared to isoflurane-based anaesthesia techniques.⁽²⁾

Because of its pharmacological properties, desflurane appears to yield a rapid early and intermediate recovery compared with sevoflurane. However, the results of different studies have been conflicting. Also, desflurane has only recently become available in India and has yet not been studied for day care laparoscopic surgery in Indian population. The aim of this prospective randomised study was to compare the emergence and recovery characteristics of sevoflurane and desflurane for outpatient gynaecological laparoscopic surgeries.

MATERIAL AND METHODS

After approval from the institutional ethics committee and review board, this randomized, prospective and interventional study was carried out in 50 ASA grade 1 or 2 patients.

Sample size was calculated to be 17 subjects in each of the two groups at α error 0.05 and study power 80%, assuming the difference in mean time to spontaneous eye opening to be detected 2.62 with SD 2.6 as per seed article so for study purpose sample size 25 was taken for each group.⁽³⁾

50 female patients aged 16-60 yr, weight 40-60 kg, ASA grade 1 and 2

undergoing laparoscopic gynaecological day care surgery were enrolled. Patients having chronic disease (DM, Renal disease, liver diseases, neuromuscular diseases, severe respiratory disease) which affects the routine life, hypersensitive to any of the drugs used in the study were excluded. Randomization was done by chit in box method.

Informed consent was obtained. Patient was taken in operating room. In operating room 20 gauge peripheral venous cannula was inserted and Ringer lactate was started. 5 lead ECG, NIBP (noninvasive blood pressure) and pulse oxymeter were attached.

Baseline data in the form of Heart rate (HR), systolic blood pressure (SBP), Diastolic blood pressure (DBP), MAP, SpO₂ were recorded. Inj. metoclopramide 10mg and inj. fentanyl 50 mcg were given as premedication by i.v. route. Patients were preoxygenated with 100% oxygen. Induction was done with inj. Propofol 2mg/kg i.v. and classic LMA (laryngeal mask airway) was inserted.

After confirming the position of LMA and fixing it, anaesthesia was maintained by N₂O (60%) + O₂ (40%) + sevoflurane (0.5-2% or desflurane (2-6%) according to the group allocated. Concentration of inhalational agent is adjusted according to requirement of surgery (change in systolic blood pressure or heart rate > 20% from baseline value)

HR, SBP and End tidal vapour concentration was noted at every 5 minute after induction. After completion of surgery all anaesthetic gases were stopped and LMA removed. Emergence and Early recovery was assessed by recording (Time of eye opening, time of obeying command, time of hand grip, time of telling name, time of telling date of birth and day of week) and then patients were shifted to recovery room after recording HR, SBP and DBP.

Modified aldrete score was noted at every 5 min. interval after shifting to recovery room till patient scored ≥ 9 . After that patients were shifted to ward and the time was noted (Time to leave recovery room). Patients were discharged to home when they were able to eat/drink, walk and were free of pain and time was noted (Time to ready to go home assessed by **POSTANAESTHESIA DISCHARGE SCORING SYSTEM (PADS)**).⁽⁴⁾

To assess late recovery, next day patients were contacted by telephone and asked about routine activity. (**ACTIVITY ASSESMENT SCORE**).⁽⁵⁾

ACTIVITY ASSESSMENT

GRADE	Level of activity
4	Full return to normal activity
3	Up and dressed but still housebound
2	Up but not dressed
1	Still in bed

Statistical analysis was performed with the SPSS, version 21 for Windows statistical software package (SPSS inc., Chicago, IL, USA).

RESULTS

The demographic profile of the patients in terms of (age, body weight, ASA status) and mean baseline variables (pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, arterial blood oxygen saturation) and duration of surgery were comparable in both the groups. (table no. 1)

Comparison of two groups regarding emergence characteristics (time of eye opening, obeying command, hand grip, telling name, telling day of week, telling DOB) showed significant difference (p value <0.05) between two groups. Duration of emergence was significantly less in Group B (desflurane) compared to Group A (sevoflurane).

Recovery time (time to leave recovery room) was also significantly less in group B than Group A. There was statistically significant difference in modified Aldrete score between both the groups at 5 and 10 minute. Score ≥9 was achieved earlier in desflurane group compared to sevoflurane group. But time to ready to go home was though earlier in desflurane group but was not statistically significant. (table no.2)

Next day activity was assessed by activity score and it was also comparable in both groups. All the patients in both the groups achieved grade 4 or 3 score by the next day.

End tidal vapour concentration was significantly less in group A (Sevoflurane) compared to group B (Desflurane) at all study points. In group B it was almost 2.5 times more than group A and this was the equipotent concentration of two groups. (table no.3)

Pulse rate, systolic and mean blood pressure was decreased after induction in both the groups at all study points but the difference between both the groups was statistically non significant.

Shivering was seen in 2 patients in sevoflurane and 3 patients in Desflurane group. Laryngospasm was seen in 1 patient in sevoflurane group and 2 patients in Desflurane group. 3 patients in Sevoflurane group and 4 in desflurane group suffered from nausea and vomiting. There was no significant difference in side effects between both groups. For shivering tramadol 100 mg was given and for nausea and vomiting ondansetron were given to those patients.

Table no. 1 Comparison of Demographic data and baseline variables between both the groups

Parameters	Group A : Sevoflurane Mean ± SD	Group B : Desflurane Mean ± SD	P value	Difference
Age(yr)	37.2± 10.68	37.81± 12.24	0.671	NS
Weight(kg)	55.22± 8.70	56.42±10.50	0.523	NS
HR(/minute)	90.32± 14.18	88.80± 16.48	0.728	NS
SBP(mmHg)	125.04± 10.00	128.32±9.04	0.229	NS
DBP(mmHg)	75.48± 11.41	80.72±11.82	0.117	NS
MAP(mmHg)	92.68± 11.65	96.25±12.68	0.301	NS
SpO2(%)	98.92± 0.74	98.58±0.84	0.130	NS

Table 2 Comparison of mean duration of Emergence and recovery between both the groups

	Group A : Sevoflurane	Group B : Desflurane	P Value	Significance
	Mean±SD	Mean ±SD		
Time of eye opening(minutes)	2.59±1.60	1.716±0.78	0.017	S
Time of obeying command(minutes)	2.93±1.59	2.11±0.833	0.028	S
Time of hand grip(minutes)	3.22±1.57	2.36±0.676	0.015	S

Time of telling name(minutes)	3.49±1.58	2.66±0.929	0.029	S
Time of telling day of week(minutes)	4.12±1.64	3.13±1.04	0.015	S
Time of telling DOB(MINUTES)	4.40±1.68	3.33±0.975	0.008	S
Ready to leave recovery room(minutes)	15.68±4.52	5.89±1.77	0.000	S
Ready to go home(hour)	5.65±0.81	4.89±0.67	0.067	NS

Table no.3 Comparison of Mean End tidal vapour concentration (%) at various interval in both groups

	Group A : Sevoflurane		Group B : Desflurane		P value	Difference
	Mean	SD	Mean	SD		
5 min	0.84	0.45	2.89	1.10	0.000	S
10 min	0.60	0.38	2.73	1.08	0.000	S
15 min	0.70	0.39	2.68	1.22	0.000	S
20 min	0.61	0.31	2.74	1.10	0.000	S
25 min	0.72	0.67	2.66	0.19	0.049	S

The above table shows that desflurane group has high end tidal vapour concentration at all study point compared to sevoflurane group. P value was <0.05 at all study point between both the groups.

DISCUSSION

For this study, 50 patients were enrolled and randomly assigned to receive desflurane (n= 25) or sevoflurane (n=25). There was no statistically significant difference between both groups regarding demographic data (P value > 0.05) (Table 1). This has helped to alleviate confounding factors and to judge the clinical significance of our study as the distribution; metabolism, excretion and action of drug are undoubtedly varied in different patients.

Early Recovery time assessed by Emergence characteristics like mean time of eye opening, time of obeying command, time of hand grip, time of telling name, time of telling DOB, time of telling day of week, time to ready to leave recovery room was less in group B (desflurane) compared to group A (sevoflurane) and was statistically significant (table no.2). Jindal R et al.⁽⁶⁾,Kajal Sachin Dalal et al.⁽⁷⁾ and Paul F.White et al.⁽⁸⁾ also found same results in their studies. The early recovery assessed by modified Aldrete score was faster in desflurane group because of its lower blood and lean tissue solubility. Blood gas coefficient, fat blood coefficient and oil gas coefficient, all are less in desflurane compared to sevoflurane so it washes out faster compared to sevoflurane.

The end point of intermediate recovery (ready to go home) assessed by PADS was though less in Desflurane group, it was not statistically significant (table no.2). The finding of this study is in consistent with previous studies conducted by Heavner et al.⁽⁹⁾, Michael H. Nathanson et al.⁽²⁾ and Patel M⁽¹⁾. Result of our study do not support the earlier study result done by Mahmoud et al.⁽³⁾ reporting that the faster emergence after discontinuation of desflurane led to an earlier discharge and more rapid resumption of normal activity compared to sevoflurane. The reason for non significant difference in intermediate recovery could be due to residual effects of drugs used for premedication, opiates and muscle relaxants.

Late recovery was studied by next day activity score and we found that all patients in both the groups resume normal activity next day ,grade 4 & grade 3 but more number of patients attained grade 4 score in Desflurane group. Both groups were comparable regarding late recovery profile.(P value >0.05).The present finding are similar to Michael H. Nathanson et al.⁽²⁾ who compared sevoflurane and desflurane for maintenance and recovery in out patient anaesthesia found similar results.

End tidal vapour concentration (table no.3) in Group A (sevoflurane) was less compared to Group B (desflurane) at all study points and it was statistically significant (P value <0.05) Our Ratio of 2.85 : 1 (desflurane : sevoflurane) of end tidal concentration of two groups was very similar to desflurane : sevoflurane ratio of 2.5:1 found by Naidu-Sjosvard and workers and 2.65: 1 found by N.A.Mahmoud et al.⁽³⁾ This ratio of end tidal concentration of the two agents at different intervals was appropriate for published MACs for the two agents (6%

& 2%) We therefore feel that approximately equipotent concentration of the two agents was given to each group. But dial concentration was more in desflurane group (2-6%) compare to sevoflurane group (0.5-2%) ..

The Haemodynamic parameters (pulse rate and blood pressure) (figure no. 1 & 2) decreased after induction at all study points in both the groups due to effect of propofol and vasodilatation by inhalational agent but the difference was statistically non significant (P value >0.05) . **Michel H. Nathanson et al**⁽²⁾, **Patel M et al.**⁽¹⁾ also reported non significant fall in pulse rate and blood pressure after induction in both the groups .

Shivering was seen in 2 patients in sevoflurane and 3 patients in Desflurane group. Laryngospasm was seen in 1 patient in sevoflurane group and 2 patients in Desflurane group. 3 patients in Sevoflurane group and 4 in desflurane group suffered from nausea and vomiting. There was no significant difference in side effects between both groups. For shivering tramadol 100 mg was given and for nausea and vomiting ondansetron were given to those patients. Similar post operative complications were seen by **Mahmoud et al.**⁽³⁾

CONCLUSION

We found Desflurane to be a suitable agent for day care procedures with faster Emergence and early recovery in comparison to sevoflurane but the time of readiness for Home discharge and Late recovery in terms of next day Activity score was though better but was not significant. Intraoperative hemodynamics and incidence of postoperative complications were also similar with both the agents .

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