



“COMPARATIVE STUDY OF EFFECT BETWEEN DESFLURANE AND SEVOFLURANE IN NORMAL BMI PATIENT DURING DAY CARE SURGERY”

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ABSTRACT Day-care surgery, that is, the patient being discharged from the hospital on the same day of surgical procedure. Day-care surgery has become a popular modality of surgical intervention throughout the globe. This study to compare effects of Desflurane and Sevoflurane on haemodynamic parameters intra-operatively and on recovery time & characteristics in patients undergoing day care surgery in normal BMI patients. To compare Modified Aldrete Score during recovery. Patient divided into two groups 30 of each. Patients who received Desflurane (Group D) and Sevoflurane (Group S) provide stable intraoperative hemodynamic, however early and intermediate recovery is significantly faster in Desflurane group (Group D) than Sevoflurane (Group S) groups.

KEYWORDS : Day care surgery, desflurane, sevoflurane, recovery time, normal BMI patient.

INTRODUCTION

Anaesthesia for day-care (ambulatory anaesthesia) surgeries may require administration of general, regional, and local anaesthesia or monitored anaesthesia care supplemented with sedation. Few procedures can be taken up for day-care anaesthesia. These include close reduction of bony fractures, Tendon repairs, Laparoscopic procedures such as appendectomy and cholecystectomy, Inguinal hernia surgery, Umbilical hernia surgery, Haemorrhoidectomy, Ectopic gestation and removal of products of conception, Breast abscess drainage, Wound debridement, and various other Incision and Drainage procedures.

Potential benefits

- The procedure planned should carry minimal risk of major post-operative complications needing immediate intervention (hemorrhage, cardiovascular instability). Some urgent procedures such as drainage of abscesses and some trauma surgeries, etc., can benefit the patients if taken up as day-care cases.
- There should be no requirement of prolonged specialist post-operative care or observation.
- Post-operative pain is amenable to oral analgesics with or without regional anesthetic techniques.
- Rapid resumption of normal functions such as oral nutrition, early and safe mobilization should be possible.
- Anaesthesia related side effects that delay discharge are minimal like postoperative nausea, vomiting (PONV), drowsiness, urinary retention, etc.

Though we are giving anaesthesia for day care surgery, our main goal is to provide hemodynamically stable environment for surgery and a balanced steady state of anaesthesia (triad of narcosis unconsciousness + autonomic reflex suppression + muscle relaxation) required for haemodynamic stability during surgery along with a better surgical field.

Either the choice of anaesthesia is one of the contributing factors for the speed of recovery from anaesthesia. Inhalation agents with low blood-gas partition coefficient like Desflurane and Sevoflurane (0.42 & 0.65 respectively) have an advantage of rapid recovery and early emergence during general anaesthesia than Isoflurane (blood-gas partition coefficient 1.46)

Both Desflurane and Sevoflurane are rapidly eliminated with minimum metabolism breakdown and may reduce cognitive dysfunction in surgical patients and facilitate a faster recovery after general anaesthesia.

METHOD

A study of 60 patients of either sex, ASA-I/II/III in the age more than 14 years with normal BMI 18.5 to 24.99 was conducted in patients after obtaining informed consent in a civil hospital, Ahmedabad during a period from 2020-2021.

Study Design:

- A randomized, prospective and controlled study was done. - 60 patients were divided into two equal groups.
- 1. Group D (Desflurane): Desflurane (3-6%) + 50% O₂ & 50% N₂O.
- 2. Group S (Sevoflurane): Sevoflurane (1-3%) + 50% O₂ & 50% N₂O.

Patient Selection Criteria:

Inclusion Criteria:

Patients in the age group more than 14 years, BMI 18.5 to 24.99 kg/m², Either gender, Written and informed consent, ASA GRADE I, II and III patients, Patient undergoing Day care surgery.

Exclusion Criteria:

Those with clinically severe significant cardiovascular, respiratory, hepatic, renal, neurologic, psychiatric or metabolic disease, ASA GRADE IV and V patients, Patients less than 14 years, Pregnant women, Morbid obesity (BMI > 40 kg/m²), Underweight patients (BMI < 18.5 kg/m²), Those with a history of chronic drug abuse or drug allergy, Patients who had undergone anaesthesia within the previous 7 days.

MATERIALS AND METHODOLOGY

In operation theatre intravenous cannula of proper size were inserted into the largest vein on the forearm and an infusion of lactated ringer's solution or Dextrose Normal saline were started at a rate of 5 ml/kg/hr. All the patients were premedicated with intravenous Glycopyrrrolate 0.004 mg/kg, Ondansetron 0.15 mg/kg, Fentanyl 2 µg/kg. ECG, NIBP, SpO₂, ET CO₂ were monitored. Baseline hemodynamic parameters were recorded. All the patients were preoxygenated with 100% O₂ for 3-5 mins. All the patients were induced with Inj. Propofol 2.5 mg/kg IV. Patients were intubated with appropriate size of Endotracheal cuffed tube after giving Inj. Succinylcholine 2 mg/kg IV. Inj. Vecuronium 0.1 mg/kg or Inj. Atracurium 0.5 mg/kg as a muscle relaxant. Now patients were randomly divided into one of the following two groups 30 patients each as per study drug injected.

- Group S (Sevoflurane): Patients maintained on Sevoflurane (1-3%), 50% O₂ & 50% N₂O
- Group D (Desflurane): Patients maintained on Desflurane (3-6%),

50% O2 & 50% N2O.

The inspired concentration of the volatile anaesthetic was adjusted to maintain MAP within 20% of baseline values. Muscle relaxation was maintained by intermittent doses of vecuronium Bromide/ Atracurium. Intraoperative SpO2, NIBP, ECG, Heart rate, EtCO2 were monitored. All the patients were ventilated by close circuit to maintain an EtCO2 of 30-35 mmHg. Rescue bolus dose of Fentanyl citrate 0.5 µg/kg were administered to control acute haemodynamic changes not controlled by a 50% increase in inspired concentration of inhalation agent. The volatile anaesthetic agent was discontinued at the end of the procedure and the Nitrous Oxide was discontinued after the last skin suture. Patients were reversed with Inj. Glycopyrrolate 0.008 mg/kg and Inj. Neostigmine 0.05 mg/kg IV. Inj. Paracetamol 15 mg/kg was administered for postoperative pain relief. Perioperative hemodynamic parameters were recorded. Postoperative recovery was assessed by the time from administration of reversal agent to response to painful stimuli, to eye opening, to verbal commands, stating name, stating the residential place, able to squeeze fingers, able to lift limb. Modified ALDRETE Score was recorded at the time of arrival to PACU. Time to achieve the Alderme score of 9 was also recorded.

Patients were monitored for the mean time for various recovery characteristics (respond to painful stimuli, Eye opening, respond to simple verbal commands, Stating name, limb movement). Modified Aldrete Score was recorded at regular intervals. Time to achieve the Aldrete score of 9 w and Extubation time were recorded. Patients were observed for adverse events, for example, bradycardia, hypotension, vomiting and hypertension during postoperative period in post anaesthesia care unit.

OBSERVATION AND RESULTS

The study was done in Anaesthesia department, B. J. Medical College and civil hospital, Asarwa, Ahmedabad in 60 patients with normal BMI undergoing Day care surgery. They were divided into two groups: group D and group S. Group S received Sevoflurane and Group D received Desflurane as maintenance anaesthetic agent. In data analysis, comparison of parameters between two groups of patients were carried out by applying unpaired t-test. Interpretation was done according to p-value.

- p < 0.05 – significant
- p < 0.001 – highly significant
- p ≥ 0.05 – not significant

All the patients were divided in following groups:

- Group D (Desflurane) – Patients receiving Desflurane as anaesthetic agent
- Group S (Sevoflurane) – Patients receiving Sevoflurane as anaesthetic agent

Table 1: Distribution according to Age in both the groups

Age (year)	Desflurane	Sevoflurane
≤ 20	7 (23.3%)	8 (26.7%)
21 - 40	14 (46.7%)	8 (26.7%)
41 - 60	9 (30%)	12 (40%)
≥ 60	0 (0%)	2 (6.7%)
Total	30 (100%)	30 (100%)
Mean ± SD	33.94 ± 15.03	36.3 ± 14.55

The above table shows the age distribution in both the groups. In the Desflurane group, the majority (40%) of patients belong to the age group between 41-60 years. Whereas in the Sevoflurane group, the majority (46.7%) of patients belong to the age group between 21-40 years. The mean age of patient in group D is 33.94 ± 15.03 and group S is 36.3 ± 14.55.

Table 2: Distribution according to Gender in both the groups

Gender	Desflurane	Sevoflurane
Male	19 (63.3%)	15 (50%)
Female	11 (36.7%)	15 (50%)
Total	30 (100%)	30 (100%)

In the Desflurane group, the majority (63.3%) of patients were male and remaining 36.7% patients were female. Whereas in the Sevoflurane group, half of the patients (50%) were male and the remaining half (50%) patients were female with male: female ratio of 1:1.

Table 3: Distribution according to ASA Grade in both the groups

ASA Grade	Desflurane	Sevoflurane
II	25 (83.3%)	23 (76.7%)
III	5 (16.7%)	7 (23.3%)
Total	30 (100%)	30 (100%)

According to ASA Grading, the majority (83.3%) of patients were in the grade II and rest 16.7% of patients in the grade III in Desflurane group. In the Sevoflurane group, 76.7% of patients were in the grade II and the rest 23.3% of patients in the grade III.

Table 4: Distribution according to BMI in both the groups

BMI (kg/m2)	Desflurane	Sevoflurane
Mean	21.73	21.34
Standard deviation	2.02	1.88
Standard error	0.36	0.34
P value	0.442	

The mean BMI of patients in the Desflurane group was 21.73 kg/m2 and the mean BMI of patients in the Sevoflurane group was 21.34 kg/m2. The distribution of patients according to BMI was same in both the groups (>0.05).

Table 5: Distribution according to Duration of Anaesthesia in both the groups

Duration of Anaesthesia (min)	Desflurane	Sevoflurane
Mean	58.67	57.93
Standard deviation	18.52	18.14
Standard error	3.38	3.31
P value	0.8763	

In the Desflurane group, the mean duration of Anaesthesia was 58.67 min. Whereas in the Sevoflurane group, the mean duration of Anaesthesia was 57.93 min. Both the study groups are comparable with the duration of anaesthesia (p>0.05).

Table 6: Distribution according to Duration of Surgery in both the groups

Duration of Surgery (min)	Desflurane	Sevoflurane
Mean	51.23	49.27
Standard deviation	17.88	17.63
Standard error	3.26	3.22
P value	0.6706	

In the Desflurane group, the mean duration of Surgery was 51.23 min. Whereas in the Sevoflurane group, the mean duration of Surgery was 49.27 min. Both the study groups are comparable with the duration of Surgery (p>0.05).

Table 7: Distribution according to Response to painful stimuli in both the groups

Response to painful stimuli(min)	Desflurane	Sevoflurane
Mean	4.02	6.98
Standard deviation	0.95	0.81
Standard error	0.17	0.15
P value	<0.001	

The mean time for responding to painful stimuli in Desflurane receiving patients was 4.02 minutes and Sevoflurane receiving patients was 6.98 minutes. The time to respond to painful stimuli was faster in patients receiving Desflurane than Sevoflurane. The difference is statistically significant (p<0.001).

Table 8: Distribution according to Response to verbal command in both the groups

Response to verbal command(min)	Desflurane	Sevoflurane
Mean	5.38	8.13
Standard deviation	0.93	0.96
Standard error	0.17	0.17
P value	<0.001	

The mean time for respond to verbal command in Desflurane receiving patient was 5.38 minutes and in Sevoflurane receiving patient was 8.13 minutes. Patients receiving Desflurane had early recovery in form of verbal command than patients receiving Sevoflurane. The difference is statistically highly significant (p<0.001)

Table 9: Distribution according to Spontaneous eye opening in both the groups

Spontaneous eye opening(min)	Desflurane	Sevoflurane
Mean	5.88	8.97

Standard deviation	1.05	1.10
Standard error	0.19	0.20
P value	<0.001	

The mean time to spontaneous eye opening in Desflurane receiving patients was 5.88 minutes and in Sevoflurane receiving patients was 8.97 minutes. The time to spontaneous eye opening was faster in Desflurane receiving patients than Sevoflurane receiving patients which was statistically highly significant (P<0.001).

Table 10: Distribution according to Telling name in both the groups

Telling name (min)	Desflurane	Sevoflurane
Mean	7.92	11.87
Standard deviation	1.15	1.11
Standard error	0.21	0.20
P value	<0.001	

Above table shows the time taken for a positive response when the patients were asked to name a given object or person. The mean time taken for a positive response in Desflurane receiving patients was 7.92 minutes and in Sevoflurane receiving patients was 11.87 minutes. It is found that patients given Desflurane respond faster than patients given Sevoflurane, which was statistically significant (P<0.001).

Table 11: Distribution according to Place of stay in both the groups

Place of stay (min)	Desflurane	Sevoflurane
Mean	8.47	11.92
Standard deviation	1.11	1.19
Standard error	0.20	0.22
P value	<0.001	

Above table shows the time taken for a positive response when the patients were asked about the place of stay. The mean time taken for a positive response in Desflurane receiving patients was 8.47 minutes and in Sevoflurane receiving patients was 11.92 minutes. It is found that patients given Desflurane respond faster than patients given Sevoflurane. The difference is statistically significant (p<0.001).

Table 12: Distribution according to Squeeze fingers in both the groups

Squeeze fingers (min)	Desflurane	Sevoflurane
Mean	8.28	12.42
Standard deviation	1.33	1.11
Standard error	0.24	0.20
P value	<0.001	

The mean time for response to Squeeze fingers in Desflurane receiving patients was 8.28 minutes and in Sevoflurane receiving patients was 12.42 minutes. The time to response was faster in Desflurane receiving patients than in Sevoflurane receiving patients. The difference is statistically significant (p<0.001).

Table 13: Distribution according to Lift limb in both the groups

Lift limb (min)	Desflurane	Sevoflurane
Mean	8.82	13.33
Standard deviation	1.51	0.89
Standard error	0.27	0.16
P value	<0.001	

The time taken by patients to start lifting their limbs on command in Desflurane receiving patients was 8.82 minutes and in Sevoflurane receiving patients was 13.33 minutes. The time taken by patients to start lifting their limbs was faster in Desflurane receiving patients than in Sevoflurane receiving patients. The difference is statistically significant (p<0.001).

Table 14: Distribution according to Modified Aldrete score in both the groups

Modified Aldrete score (on arrival)	Desflurane	Sevoflurane
Mean	8.02	6.10
Standard deviation	0.79	0.99
Standard error	0.14	0.18
P value	<0.001	

Above table shows Modified Aldrete score on arrival in both the groups. The mean Modified Aldrete score on arrival in Desflurane receiving patients was 8.02 minutes and in Sevoflurane receiving patients was 6.1 minutes. The mean Modified Aldrete score on arrival was higher in Desflurane receiving patients than Sevoflurane receiving

patients, which was statistically significant (P<0.001).

Table 15: Distribution according to Time to achieve Modified Aldrete score of 9 in both the groups

Time to achieve Modified Aldrete score of 9 (min)	Desflurane	Sevoflurane
Mean	9.23	11.35
Standard deviation	1.11	1.06
Standard error	0.20	0.19
P value	<0.001	

The average time to achieve Modified Aldrete score of 9 was 9.23 minutes in Desflurane receiving patients and 11.35 minutes in Sevoflurane receiving patients. Time to achieve a score of 9 was greater in Sevoflurane receiving patients than Desflurane receiving patients which was statistically highly significant (P<0.001). That suggests Desflurane receiving patients were recovered faster than Sevoflurane receiving patients.

Table 16: Distribution according to Extubation Time in both the groups

Extubation Time (Min)	Desflurane	Sevoflurane
Mean	7.25	10.43
Standard deviation	1.01	1.10
Standard error	0.19	0.20
P value	<0.001	

The mean time for Extubation was 7.25 minutes in Desflurane receiving patients and 10.43 minutes in Sevoflurane receiving patients. Extubation was faster in Desflurane receiving patients than Sevoflurane receiving patients. Which was statistically highly significant (P<0.001).

Table 17: Distribution according to Heart Rate in both the groups

Heart Rate (per min)	Desflurane	Sevoflurane	P value
Basal	84.4 ± 8.3	85.2 ± 9.9	0.7357
Induction	101.4 ± 10.6	102.06 ± 9.7	0.8022
10 min	95.3 ± 10.4	94.5 ± 9.3	0.7546
30 min	89.8 ± 9.9	89.2 ± 8.5	0.802
60 min	81.9 ± 7.4	85.83 ± 10.86	0.1068
90 min	86.5 ± 10.2	90.33 ± 13.57	0.2215
Post Extubation	98.4 ± 7.2	97.4 ± 11.2	0.6823
30 min post Extubation	89.9 ± 8.1	87.3 ± 10.5	0.2873

Preoperative pulse rate was comparable in both the groups. Even during the induction pulse rate did not differ in two groups. However, increase in pulse rate was observed during intubation in both the groups. Intra-operatively pulse rate did not differ in both the groups. The difference is statistically not significant (p>0.05).

Table 18: Distribution according to Mean Arterial Blood Pressure in both the groups

Mean Arterial Blood Pressure (mmHg)	Desflurane	Sevoflurane	P value
Basal	74.2 ± 7.8	75.7 ± 7.1	0.4392
Induction	81.4 ± 7.6	81.9 ± 7.3	0.7959
10 min	77.0 ± 8.0	76.7 ± 5.9	0.8693
30 min	76.1 ± 7.7	75.2 ± 6.4	0.6243
60 min	72.7 ± 4.0	73.3 ± 6.2	0.6577
90 min	73.8 ± 11.0	72.4 ± 4.2	0.5175
Post Extubation	80.4 ± 8.0	79.7 ± 5.9	0.7011
30 min post Extubation	74.5 ± 8.4	74.7 ± 6.6	0.9187

Intra-operative Mean Arterial Blood Pressure did not differ in both the groups during course of anaesthesia. The rise in blood pressure was observed at the time of intubation in both the groups, but this rise is within 20% of baseline value with both the anesthetic agents. The difference is statistically not significant (p>0.05).

Table 19: Distribution according to Side Effects in both the groups

Side Effects	Desflurane	Sevoflurane
Nausea	2 (6.7%)	2 (6.7%)
Vomiting	2 (6.7%)	3 (10%)
Dizziness	0 (0%)	1 (3.4%)

Above table shows Side Effects in both the groups. In Desflurane receiving patients, postoperative side effects observed were Nausea (6.7%) and Vomiting (6.7%). In Sevoflurane receiving patient, Vomiting was observed in 10% of patients followed by Nausea (6.7%)

and Dizziness (3.4%).

Table 20: Correlation of response to recovery parameters in both the groups

Recovery Parameters	Desflurane	Sevoflurane	P value
Response to painful stimuli (min)	4.02 ± 0.95	6.98 ± 0.81	<0.001
Response to verbal command (min)	5.38 ± 0.93	8.13 ± 0.96	<0.001
Spontaneous eye opening (min)	5.88 ± 1.05	8.97 ± 1.10	<0.001
Telling name (min)	7.92 ± 1.15	11.87 ± 1.11	<0.001
Place of stay (min)	8.47 ± 1.11	11.92 ± 1.19	<0.001
Squeeze fingers (min)	7.98 ± 1.85	12.42 ± 1.11	<0.001
Lift limb (min)	8.82 ± 1.51	13.33 ± 0.89	<0.001
Modified Aldrete score (on arrival)	8.02 ± 0.14	6.10 ± 0.99	<0.001
Time to achieve Modified Aldrete score of 9 (min)	9.23 ± 1.11	11.35 ± 1.06	<0.001
Extubation Time (min)	7.25 ± 1.01	10.43 ± 1.10	<0.001

The time to recovery of parameters like response to painful stimuli, respond to verbal command, spontaneous eye opening, telling name and place of stay, squeezing fingers and limb lifting were significantly shorter in Desflurane than Sevoflurane. Time to achieve Modified Aldrete Score of 9 and Extubation Time was significantly faster in Desflurane than Sevoflurane.

Summary

We studied 60 patients with normal BMI and ASA physical status I-II-III undergoing Day care surgeries under general anaesthesia for hemodynamic changes and recovery following Sevoflurane and Desflurane as an Inhalational anaesthesia. Patient's characteristic like age, weight, gender and BMI was comparable in both the groups. Duration of surgery and anaesthesia was comparable in both the groups. There was no statistical difference in Intraoperative heart rate and Mean blood pressure changes in the two groups. The recovery was significantly faster in Desflurane group than in Sevoflurane group.

CONCLUSION

We concluded that both Desflurane and Sevoflurane provide stable intraoperative hemodynamic, however early and intermediate recovery is significantly faster in Desflurane group than Sevoflurane group.

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