

“DESFLURANE VERSUS SEVOFLURANE: FOR INTRAOPERATIVE HAEMODYNAMICS AND RECOVERY CHARACTERISTICS IN PATIENTS RECEIVING GENERAL ANAESTHESIA: A PROSPECTIVE RANDOMIZED COMPARATIVE STUDY”

Anaesthesiology

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ABSTRACT

BACKGROUND: Use of inhalational agents in hemodynamic maintenance, faster emergence and recovery for ambulatory anaesthesia.

Methods: A randomized clinical trial was conducted in Alluri Sitarama Raju Institute Of Medical Sciences, Eluru. 70 patients were scheduled for surgical procedures under general anaesthesia in between 2017-2018. The patients were randomly divided into two groups. Group S received sevoflurane and group D received desflurane as maintenance. Hemodynamic status, duration of surgery, emergence times and recovery time in PACU was assessed.

Results: The time to extubation was less in the Desflurane group as compared to the Sevoflurane group which was statistically highly significant. The early recovery Profile was significant between the two groups, with shorter recovery time in desflurane group.

Conclusion: Desflurane ensures faster recovery in early post operative period compared to sevoflurane.

KEYWORDS

Inhalational agents, faster recovery

INTRODUCTION:

General anesthesia can broadly be defined as a drug-induced reversible depression of the central nervous system resulting in the loss of response to and perception of all external stimuli. It is usually defined as a triad of amnesia, analgesia, and muscle relaxation.

Inhaled volatile anaesthetics remain the most widely used drugs for maintenance of general anaesthesia because of their predictable intraoperative and recovery characteristics.

Inhaled anaesthetics allow rapid emergence from anaesthesia because of easy titrability with inherent neuromuscular blocking effects that make them more suitable for ambulatory anaesthesia.

Given the low blood: gas partition coefficient of sevoflurane [0.63] and desflurane [0.42], faster emergence is expected than halothane.

Both Sevoflurane and desflurane, are volatile anaesthetic agents and halogenated ether compounds and have shorter emergence time. sevoflurane has rapid induction due to low blood: gas partition. Because of its pharmacological properties, desflurane has rapid early and intermediate recovery compared with sevoflurane.

The purpose of this prospective randomized study was to assess and compare the intraoperative haemodynamics, maintenance and recovery characteristics after anaesthesia with Desflurane and Sevoflurane in patients undergoing general anaesthesia.

MATERIALS AND METHODS:

After ethical committee approval and written informed consent from patients, study was conducted on 70 patients. All were ASA I and II patients undergoing elective surgical procedures under general anaesthesia lasting for less than 3 hours but more than 1 hour duration.

Inclusion criteria:

Age Group – 18-60 years
Either gender
ASA – I/II
GCS 12-15

Exclusion criteria:

- Patients with severe cardiopulmonary disease
- Patients with severe hepatic or renal dysfunction, endocrinal disturbances
- Patients with neurological or psychiatric disorders
- History of drug allergy or abuse
- Patients on CNS depressant drugs
- Pregnant or lactating women
- Patients with Body mass index (BMI) of $>30 \text{ kg/m}^2$.

PREOPERATIVE PREPARATION:

In the preoperative examination, patients were asked about history of systemic illness, any allergic reactions to drugs, History of any muscular dystrophies, neuromuscular disorders, family history of any malignant hyperthermia and History of any previous surgeries were noted. Examination of the cardiovascular system, respiratory system and Airway assessment was done to rule out any difficult intubation. Apart from the routine blood investigations, electrocardiogram and chest x-ray were ordered in patients greater than 40 years of age.

Hypertensive patients were advised to continue the antihypertensives and Diabetic patients were advised to skip the morning dose of insulin and to send the patient with the FBS, serum electrolytes on the day of surgery.

PREPARATION OF THE PATIENT:

All patients were kept NPO for minimum of 6 hours for solids and 2 hours for clear liquids. In preoperative room, all patients were premedicated with IV midazolam 0.05 mg/kg and IV glycopyrrolate 10 µg/kg 30 minutes prior to induction.

The patients were randomly allocated into two groups:

GROUPS- Sevoflurane 35 patients
GROUP D-Desflurane 35 patients

PROCEDURE DETAILS:

After shifting the patient, monitors were connected and IV line secured.

Induction:

Preoxygenation was done with 100% O₂ for 3 min and induced with IV Propofol 2 mg/kg. After adequate mask ventilation, Inj. Succinylcholine 1.5 mg/kg was given. Laryngoscopy & Intubation was done with appropriate size, cuffed endotracheal tube. Closed circuit was connected and bilateral equal air entry was confirmed and secured.

Maintenance:

Group D was maintained with 3% desflurane and group S with 1% sevoflurane in 50% oxygen with 50% nitrous oxide. Dial concentration was adjusted to control mean arterial pressure (MAP) and HR within 20% of the preoperative values. Neuromuscular blockade was maintained with injection vecuronium, initial bolus dose of 0.1 mg/kg followed by 0.02 mg/kg every 30 minutes. end tidal carbon dioxide was maintained between 35 and 40 mmHg. Mean arterial pressure and heart rate were noted before induction, after induction, at 20 min, 40 min, 80 min, 120 min after induction. Any reduction in the MAP more than 20% from the baseline value, was treated with bolus of intravenous fluids. When the hemodynamics of the patient was unresponsive to the

above measures, the patient was excluded from the study.

REVERSAL:

Nitrous oxide and volatile anesthetics were discontinued after the last skin suture. Residual neuromuscular blockade was reversed with IV neostigmine 50µg/kg and IV glycopyrrolate 10µg/kg. Patients were extubated when they fulfilled the extubation criteria and were shifted to PACU in hemodynamically stable condition.

MONITORING:

A. Heart rate, MAP, SpO₂ recorded before induction, after induction, intraoperatively at 20 min, 40 min, 80min, 120min and then postoperatively every 5 min till the modified Aldrete score was >9

B. Duration of the surgery (From time of incision to last skin suture)

C. Following emergence times were noted:

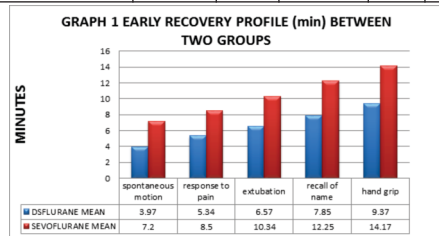
- Time taken for spontaneous motion
 - Time taken for response to pain
 - Extubation time (from the time of discontinuation of anesthetic agents to removal of endotracheal tube)
 - After extubation, orientation was assessed
 - Time taken to Hand grip
- D. In the post - anaesthesia care unit (PACU) recovery was assessed by the modified Aldrete score.

OBSERVATION AND RESULTS:

In this prospective, randomized study, 70 adult patients admitted to ASRAM MEDICAL COLLEGE, ELURU, undergoing elective surgeries under general anaesthesia were randomly given Desflurane or Sevoflurane as maintenance agents. The effects of Desflurane and Sevoflurane on hemodynamics and recovery characteristics were observed.

Table 1. Early Recovery Profile(min) Between Two Groups

	DESFLURANE		SEVOFLURANE		P VALUE
	MEAN	SD	MEAN	SD	
SPONTANEOUS MOTION	3.97	.70	7.2	.75	.0001
RESPONSE TO PAIN	5.34	.87	8.54	.85	.0001
EXTUBATION	6.57	.85	10.34	1.08	.0001
RECALL OF NAME	7.85	.80	12.25	1.22	.0001
HAND GRIP	9.37	.97	14.17	1.31	.0001



In Group Desflurane, the mean & SD time taken for SPONTANEOUS MOTION was 3.97 ± 0.7 min, RESPONSE TO PAIN was 5.34 ± 0.87 min, to EXTUBATION was 6.57 ± 0.85 min, and mean Time taken to RECALL OF NAME was 7.85 ± 0.80 min, and HAND GRIP was 9.37 ± 0.97 min. In Group S, the mean & SD time taken for SPONTANEOUS MOTION was 7.2 ± 0.75 min, RESPONSE TO PAIN was 8.54 ± 0.85 min, to EXTUBATION was 10.34 ± 1.08 min, RECALL OF NAME 12.25 ± 1.22 min and HAND GRIP was 14.17 ± 1.31 min. The early recovery profile was significantly faster in group Desflurane compared to group Sevoflurane with P value being (<0.0001) indicating a significant difference.

Table-2 Modified Aldrete Score At Group D (<10,>10) And Groups (<16,>16)

	TIME TAKEN TO ACHIEVE MODIFIED ALDRETE SCORE				
	MEAN	SD	MEAN	SD	P VALUE
DESFLURANE(<10,>10)(min)	9.64	0.49	11.22	0.42	0.0001
SEVOFLURANE(<16,>16)(min)	15.2	0.94	17.6	0.75	0.0001

The recovery profile indicated by modified aldrete score at 10 min and

16 min interval and time taken to achieve modified aldrete score of >9 was significantly faster in Group D compared to Group S with p value being <0.001 indicating a highly significant difference between the two groups. In Group Desflurane, the mean score at <10 min. and >10 min. were 9.64 ± 0.49 and 11.22 ± 0.42 , whereas in Group Sevoflurane, the mean score at <16 min. and >16 min. were 15.2 ± 0.94 and 17.6 ± 0.75 respectively indicating faster intermediate recovery in Desflurane group compared to the Sevoflurane group.

DISCUSSION:

With introduction of less soluble volatile anaesthetics such as Desflurane and Sevoflurane, general anaesthesia is the anesthetic technique of choice for many patients as these inhalational anaesthetics provide amnesia, maintain hemodynamics and promote early recovery from anaesthesia.

Our data analysis revealed that the time to extubation was less in the Desflurane group as compared to the Sevoflurane group which was statistically highly significant. The early recovery Profile was significant between the two groups, with shorter recovery time in desflurane group.

Mayur Patel et al⁴, 2016 compared hemodynamic parameters and recovery characteristics between sevoflurane and desflurane in patients undergoing day care gynecological laparoscopic surgery. Time to recovery characteristics was shorter in desflurane group than in sevoflurane group.

Manish B Kotwani et al³, 2017 compared maintenance, emergence and recovery characteristics of sevoflurane and desflurane in 60 pediatric ambulatory surgeries. Perioperative hemodynamics, and duration of inhalational anesthesia were compared. They concluded that Desflurane provides faster emergence and recovery in comparison to sevoflurane.

In a study conducted by Weiskopf RB et al⁸, there was an increase in heart rate when desflurane concentration was increased rapidly to 1.66 MAC.

Sonia kapil et al¹ in 2018 compared Desflurane, propofol and sevoflurane when used for maintenance of anesthesia under during TSS for pituitary adenoma. They observed statistically significant difference in between desflurane and sevoflurane groups. Their study is comparable with our study with time to extubate being shorter in desflurane group than sevoflurane group.

Joseph G Werner et al² in 2015 compared the effects of desflurane and sevoflurane on anaesthesia recovery time in patients undergoing urological cystoscopic surgeries. This study is comparable with our study of time to spontaneous motion which was shorter in group desflurane (3.97 ± 0.70 min) than group sevoflurane (7.2 ± 0.75 min).

Eshima RW et al⁵ also found that patients in whom Desflurane and Sevoflurane was administered via a Laryngeal Mask Airway, patients anaesthetized with Desflurane recovered sooner with respect to their Aldrete scores.

CONCLUSION:

We conclude that the inhalational agent, Desflurane, ensures faster recovery in early postoperative period as evident from significant decrease in the time required for extubation and the time required to achieve a modified Aldrete score of ≥ 9 when compared to patients receiving Sevoflurane.

In the patients receiving Desflurane spontaneous motion, response to pain and extubation was sooner. Both inhalational agents, Desflurane and Sevoflurane had no negative effects on the intraoperative as well as the early postoperative haemodynamic parameters and provide cardiovascular stability when titrated to maintain within 20% of the baseline values.

REFERENCES:

- Sonia Kapil, Nidhi Panda, Sujay Samanta, Ashish Kumar Sahoo Comparison of Recovery Profile of Propofol, Sevoflurane, and Desflurane Anesthesia in Transnasal Trans-sphenoidal Surgery for Pituitary Tumors: A Prospective Randomized Trial. Journal of Neuroanaesthesiology and Critical Care 2018; 05(03): 158-163
- Joseph G. Werner, Karina Castellon-Larios, Cattleya Thongrong, Bodo E. Knudsen, Deborah S. Lowery, Maria A. Antor, and Sergio Daniel Bergese Desflurane Allows for a Faster Emergence Compared to Sevoflurane without Affecting the Baseline Cognitive Recovery Time Front Med (Lausanne). 2015; 2: 75

3. Manish B. Kotwani, Anila D. Malde Comparison of maintenance, emergence and recovery characteristics of sevoflurane and desflurane in pediatric ambulatory surgery 2018, IP: 223.182.110.253
4. Mayur Patel, Neelam Parmar.Comparison of hemodynamic parameters and recovery characteristics between sevoflurane and desflurane in patients undergoing day care gynecological laparoscopic surgery. 2016;5(7): 1412- 1416
5. Rachel Eshima Mckay, Hall KT, Hills NThe Effect of Anesthetic Choice (Sevoflurane Versus Desflurane) and Neuromuscular Management on Speed of Airway Reflex Recovery. 2016;122(2):393-401.
6. Nathanson MH, Fredman B, Smith I, White PF. Sevoflurane versus desflurane for outpatient anesthesia: a comparison of maintenance and recovery profiles.Anesth Analg. 1995 Dec;81(6):1186-90.
7. Kapoor M Vakamudi M. Desflurane - Revisited. Journal of Anaesthesiology Clinical Pharmacology. 2012;28(1):92.
8. Weiskopf R, Sampson D, Moore M. The desflurane (Tec 6) vaporizer: design,design considerations and performance evaluation. BJA: British Journal of Anaesthesia. 1994;72(4):474-479.
9. Patel SS, Desflurane. A review of its pharmacodynamic and pharmacokinetic properties and its efficacy in general anaesthesia. Drugs.1995 Oct;50[4]:742-67. 86
10. Philip JH. GAS MAN® - Understanding anesthesia uptake and distribution. Med Man Simulations Inc., Chestnut Hill, 1997.