Original article:

Comparative Evaluation of Efficacy of Desflurane with Sevoflurane for Recovery Profile and Airway Responses: A Prospective Study

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Abstract

Background: Sevoflurane and desflurane have been in use for ambulatory anaesthesia as they both have properties of an ideal agent. With the advent of minimally invasive surgical techniques, ambulatory surgeries are on the rise, leading to an increased demand for fast tracking.

Aim of the study: To compare efficacy of Desflurane with Sevoflurane for recovery profile and airway responses.

Materials and methods: The study was conducted in the Department of Anesthesia of R.B.M. Hospital, Bharatpur, Rajasthan, India. For the study we selected 44 patients belonging to American Society of Anesthesiologists physical status I and II scheduled for surgical procedures at general surgery department. The patients were randomly grouped into two groups with 22 patients in each group, Group 1 and Group 2. Group 1 patients received sevoflurane for maintenance of anesthesia whereas Group 2 received desflurane for maintenance of anesthesia.

Results: A total of 44 patients were included in the study. Mean age of patients in group 1 was 51.09 years and in group 2 was 53.33 years. Number of male patients in group 1 was 14 and in group 2 were 16. Mean weight of patients in group 1 was 61.28 kg and in group 2 was 64.25 kg.

Conclusion: Within the limitations of the study we conclude thatDesflurane has an overall better quality of early recovery in patients as compared to sevoflurane.

Keywords: Sevoflurane, Desflurane, anesthesia, recovery

Introduction:

Desflurane, an inhalational agent with the least blood gas solubility coefficient and hence fastest recovery has been widely used for the maintenance of general anesthesia for ambulatory surgery in adults.[1]Desflurane has lower blood gas solubility than sevoflurane resulting in rapid induction and emergence from anaesthesia. However, desflurane is pungent and can be irritant to the airway leading to coughing, breathholding, laryngospasm and copious secretions. This property may make sevoflurane an agent of choice for cases on spontaneous respiration.[2] Sevoflurane and desflurane have been in use for ambulatory anaesthesia as they both have properties of an ideal agent. With the advent of minimally invasive surgical techniques, ambulatory surgeries are on the rise, leading to an increased demand for fast tracking.[3, 4] This necessitates early recovery in the form of clear-headedness, control of protective airway reflexes and satisfactory relief from pain and emesis. As a result, there is a need for the use of short-acting anaesthetic drugs for a better quality of recovery. Sevoflurane and desflurane have been in use for ambulatory anaesthesia as they both

have properties of an ideal agent.[5, 6] Hence, we planned the study to compare efficacy of Desflurane with Sevoflurane for recovery profile and airway responses.

Materials and methods:

The study was conducted in the Department of Anesthesia of R.B.M. Hospital, Bharatpur, Rajasthan, India. The ethical clearance for the study was obtained from the ethical board of the institute prior to commencement of the study. For the study we selected 44 patients belonging to American Society of Anesthesiologists physical status I and II scheduled for surgical procedures at general surgery department. The patients were randomly grouped into two groups with 22 patients in each group, Group 1 and Group 2. Group 1 patients received sevoflurane for maintenance of anesthesia whereas Group 2 received desflurane for maintenance of anesthesia. The anesthesia was induced for each patient according to the standardized guidelines. During the maintenance of anesthesia and during post-operative period, we studied the occurrence of cough, hiccups, breathholding and larygospasm. Another qualified anaesthetist unaware of the inhalational agent used, assessed the time taken from switching off of the vaporiser to eye opening, time to obey verbal commands (tongue protrusion), time to sit with support, time to shift out of the recovery room and orientation in time, place and person.

The statistical analysis of the data was done using SPSS version 20.0 for windows. The Student's t-test and Chi-square test were used to check the significance of the data. The p-value less than 0.05 was predetermined as statistically significant.

Results:

A total of 44 patients were included in the study. Table 1 shows the demographic data of the patients. Mean age of patients in group 1 was 51.09 years and in group 2 was 53.33 years. Number of male patients in group 1 was 14 and in group 2 were 16. Mean weight of patients in group 1 was 61.28 kg and in group 2 was 64.25 kg. The mean height of patients in group 1 was 1.59 cm and in group 2 was 1.62 cm. Table 2 shows the comparative analysis of Recovery variables for Group 1 and 2. Total recovery time in group 1 was 47.89+13.29 min and in group 2 was 28.64+6.78 min. Time for opening eyes postoperatively was 11.55+6.02 min and 4.39+2.01 min. Time taken to respond to verbal commands was 12.51+6.1 min and 7.02+2.3 min. Time duration to sit in bed with support was 41.02+11.09 min and 19.23+4.8 min. On comparison the results were observed as statistically significant. ($p<0.05$) [Fig 1]

Discussion:

In the present study we compared efficacy of Desflurane with Sevoflurane for recovery profile and airway responses. We observed that patients receiving Sevoflurane were more efficacious and had less post-operative recovery time. The results were statistically significant. The results were compared with previous studies and results were consistent with previous studies.Welborn LG et al compared the emergence and recovery characteristics of sevoflurane, desflurane, and halothane in children undergoing adenoidectomy with bilateral myringotomy and the insertion of tubes. Eighty children 1-7 yr of age were studied. Thirty minutes prior to the induction of anesthesia, all patients received 0.5 mg/kg midazolam orally. Patients were randomly assigned to one of four groups: Group 1, sevoflurane induction and maintenance (S:S); Group

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2, halothane induction and sevoflurane maintenance (H:S); Group 3, halothane induction and maintenance (H:H); or Group 4, halothane induction and desflurane maintenance (H:D). Tracheal intubation was facilitated with the use of a single dose of 0.2 mg/kg mivacurium. A Mapelson D circuit was used, and all patients received N2O:O2 60:40 for induction and maintenance at standardized appropriate fresh gas flow. Ventilation was controlled to maintain normocapnia. End-tidal concentration of anesthetics was maintained at approximately 1.3 minimum alveolar anesthetic concentration (MAC) (halothane: 0.56; sevoflurane: 2.6; desflurane: 8.3) until the end of surgery when all anesthetics were discontinued. Emergence (extubation), recovery (Steward score 6), and discharge times were compared among patients in the four groups using analysis of variance and Newman-Keuls tests $P < 0.05$ was considered significant. There were no significant differences among the four groups with respect to age, weight, duration of surgery, or duration of anesthesia. Emergence and recovery from anesthesia were significantly faster in the desflurane group (Group 4) compared with the sevoflurane and halothane groups (Groups 1, 2, and 3). There was a significantly greater incidence of postoperative agitation and excitement in patients who received desflurane (55%) versus sevoflurane (10%) and halothane (25%). There were no significant differences among the four groups with respect to the time to meet home discharge criteria, in the time to drink oral fluids, or in the incidence of postoperative vomiting. It is concluded that, although desflurane resulted in the fastest early emergence from anesthesia, it was associated with a greater incidence of postoperative agitation. Sevoflurane resulted in similar emergence and recovery compared with halothane. Desflurane and sevoflurane did not result in faster discharge times than halothane in this patient population. White PF et al randomized 130 outpatients undergoing superficial surgical procedures requiring general anesthesia to one of two maintenance anesthetic treatment groups. All patients were induced with propofol, 2 mg/kg IV, and after placement of a laryngeal mask airway, anesthesia was maintained with either sevoflurane 1%-3% or desflurane 3%-8% in an air/oxygen mixture. The inspired concentration of the volatile anesthetic was varied to maintain hemodynamic stability and a Bispectral Index value of 50-60. Analgesia was provided with local anesthetic infiltration and ketorolac (30 mg IV). Antiemetic prophylaxis consisted of a combination of ondansetron (4 mg), dexamethasone (4 mg), and metoclopramide (10 mg) at the end of surgery. Assessments included recovery times to eye opening, response to commands, orientation, fast-track score of 14, first oral intake, sitting, standing, ambulating unassisted, and actual discharge. Patient satisfaction with anesthesia, the ability to resume normal activities on the first postoperative day, adverse side effects (e.g., coughing, purposeful movement, oxygen desaturation <90%, sore throat, postoperative nausea, and vomiting), and the requirement for postoperative analgesic and antiemetic drugs were recorded in the early postoperative period and during the initial 24-h period after discharge. The two study groups had comparable demographic characteristics. Although the overall incidence of coughing during the perioperative period was higher in the desflurane group, the incidences of coughing during the actual administration of the volatile anesthetics (i.e., the maintenance period) did not differ between the two groups. Emergence from anesthesia was more rapid after desflurane; however, all patients achieved fast-

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track recovery criteria before leaving the operating room. Finally, the time to discharge home and the percentage of patients able to resume normal activities on the first postoperative day did not differ significantly between the two anesthetic groups. They concluded that the use of desflurane for maintenance of anesthesia was associated with a faster emergence and a higher incidence of coughing. [7, 8]

Werner JG et al compared the effect of desflurane and sevoflurane on anesthesia recovery time in patients undergoing urological cystoscopic surgery. This investigation included 75 ambulatory patients. Patients were randomized to receive either desflurane or sevoflurane. Inhalational anesthetics were discontinued after removal of the cystoscope and once repositioning of the patient was final. Coughing assessment and awakening time from anesthesia were assessed by a blinded observer. The primary endpoint, mean time to eye-opening, was 5.0 ± 2.5 min for desflurane and 7.9 ± 4.1 min for sevoflurane. There were no significant differences in time to SOMCT recovery, overall time spent in the post-anesthesia care unit (PACU) or time to discharge. Median time until readiness for discharge was 9 min in the desflurane group, while the sevoflurane group had a median time of 20 min. The overall incidence of coughing during the perioperative period was significantly higher in the desflurane. They concluded that the patients receiving desflurane had a faster emergence and met the criteria to be discharged from the PACU earlier. Green MS et al characterized the severity and duration of cognitive impairment following sevoflurane or desfluane anesthesia after brief surgery using tests of cognitive ability to objectively testing performance. Patients were randomized to receive either a desflurane or sevoflurane-based anesthetic. On the morning of the surgery the subjects performed baseline cognitive task tests (Mini Mental Status exam, Trail Making Test Part A and B, Digit Symbol Coding, Hopkins Verbal Learning Test, Stroop Color and Word Test to determine baseline cognitive function. Cognitive testing was repeated 30 minutes and 1 hour after surgery whereas Modified Telephone Interview for Cognitive Status (TICS-M) and Memory Aging Telephone Screen (MATS) was used on the following day of surgery. Trail Making Test Part B cognitive test showed statistically significant in comparison for pre and post exposure of anesthetics. This difference was seen in the desflurane group. Other cognitive tests did not show differences on exposure to the anesthetic gases. Their study showed no statistically significant cognitive decline except for those in the Trail Making Part B in the Desflurane group. This conclusion is limited by the inherent limitations of the study, but does reinforce that the systemic inflammatory response from the surgery contributes cognitive impairment.[9, 10]

Conclusion:

Within the limitations of the study we conclude thatDesflurane has an overall better quality of early recovery in patients as compared to sevoflurane.

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Diags and tables:

Table 1: Demographic details of the patients

Parameters	**Group 1**	**Group 2**
No. of subjects	22	22
Mean age (years)	51.09	53.33
No. of male patients	14	16
Mean weight (kg)	61.28	64.25
Mean height (cm)	1.59	1.62

Table 2: Comparative analysis of Recovery variables for Group 1 and 2

Recovery variables	Group 1	Group 2	p-value
Total recovery time (min)	47.89+13.29	28.64+6.78	0.002
Opening eyes (min)	11.55+6.02	4.39+2.01	
Response to verbal commands (min)	12.51+6.1	7.02+2.3	
Sit in bed with support (min)	41.02+11.09	19.23+4.8	
Orientation (mm)	14.28+7.23	7.08+3.1	

Fig 1: **Comparative analysis of Recovery variables for Group 1 and 2**