Original Article

Comparative study of recovery after desflurane versus sevoflurane anaesthesia in laproscopic surgery

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Abstract

Objective: To assess and compare the early and intermediate recovery characteristics after anaesthesia with sevoflurane and desflurane **Study Design**: Randomized controlled trial **Materials and Method**: After institutional ethics committee approval and written informed consent 100 healthy patients of ASA 1 and 2 were selected and divided into two groups each consisting of 50 patients. in group (S) anesthesia was maintained by Sevoflurane and in group (D) anesthesia was maintained by Desflurane, the aim was to assess and compare the early and intermediate recovery characteristies. It was observed that intraoperative hemodynamic parameters did not differ in the two groups (p >o.o5). The time to eye opening, Time of first response to commond, Time of extubation(P<0.0001) which was highly significant, and SPEED Criteria was higher after Desflurane anesthesia than after Sevoflurane anesthesia at 0 min and 5 min(P=0.03)At 10,15,20,25,30,and 60 min SPEEDS Criteria comparable in the two groups. **Conclusion:** Both Desflurane and Sevoflurane produce similar hemodynamic changes, the early recovery was significantly faster after Desflurane,
Keyword: Volatile anaesthetic: sevoflurane, Desflurane Recovery: Early, Intermediate, Laparoscopic surgery.

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INTRODUCTION

"Ambulatory anaesthesia" is the subspecialty of anaesthesia. Advancement in surgical techniques and technology eg. (Laparoscopy) and advancement in anesthesia care (use of short acting anaesthetic agents) contributed to making ambulatory surgery easier.[1]One of the major factors that determine speed of recovery from anaesthesia is the choice of anaesthetic technique. Anideal general anaesthetic, for the ambulatory patients, should provide smooth and rapid induction, rapid recovery with minimal side effects like nausea, vomiting and good analgesia while creating acceptable operating condition. Inhaled anaesthetics allow rapid emergence from anaesthesia because of easy titrability with inherent neuromuscular blocking effects that make them more suitable for ambulatory anaesthesia. The availability of less soluble inhalation anaesthetics such as sevoflurane and desflurane made us rethink about the selection of volatile anaesthetics for outpatient surgical procedures. Given the low blood: gas partition coefficient of sevoflurane and desflurane, faster emergence from anaesthesia is expected compared to traditional inhalation anaesthetics. [2] Sevoflurane, a volatile anaesthetic agent, is halogenated ether. It has rapid induction due to low blood: gas partition (blood: gas partition coefficient of 0.65 and fat: blood solubility 48 at 37°C). Desflurane is also halogenated ether. Low solubility of desflurane in blood and body tissues (blood: gas partition coefficient of 0.42 and fat: blood solubility 27 at37°C) leads to rapid induction and recovery.[3,4] Both sevoflurane and desflurane have shorter emergence times compared to isoflurane based anaesthesia techniques. [2]Because of its

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pharmacological properties, desflurane appears to yield a rapid early and intermediate recovery compared with sevoflurane. The evaluation of clinically meaningful outcomes e.g. recoverypro files has increasingly become a focal point of anesthesia related clinical research involving new drugs and technique. However, the results of different studies have been conflicting.[5,6,7,8,9] Hence the present study is undertaken to assess and compare the recovery characteristics after anaesthesia with sevoflurane or deslurane in patients scheduled to undergo laproscopic surgery. Aim isto compare the superiority of each agent, with regards to early and intermediate recovery and postoperative side effects of the two agents wiil be also analysed.

MATERIAL AND METHODS

After approval from the Institutional Ethics Committee, informed written consent was obtained, a prospective randomized study was conducted in the Department of Anaesthesiology, GMERS Medical College, Civil Hospital Gandhinagar. 100 patient of ASA physical status I or II Scheduled to undergo laparoscopic surgery, [lasting between 30 min to 120 min] were recruited for this randomised, control trial study. Patients were randomly divided into two groups of 50 each. Procedure done on Monday, Wednesday and Friday was taken as a Group S and procedure done on Tuesday, Thursday and Saturday was taken as a Group D. Group S–anesthesia was maintained with 50% N20 in o2 + ing vecuronium bromide 0.025mg/kg iv + Sevoflurane. Group D-anesthesia was maintained with 50% N2O in O2 + ing vecuronium bromide 0.025mg/kg iv + desflurane A preanaesthetic examination comprising history, general physical and systemic examination of all the patients was conducted. Routine investigations including haemoglobin, total leucocyte count, blood sugar, serum creatinine and urine examination were carried out. All patients were kept fasting for at least 8 hours prior to surgery. The study excluded the patients with significant cardiopulmonary disease, hepatic or renal dysfunction, neurological or psychiatric disorder, those with history of drug allergy or drug abuse, malignant hyperthermia, and pregnant females On arrival in the operation theatre monitors were attached and preoperative pulse, blood pressure, Spo2, etCO2 and ECG was recorded. In all patients venous cannula was inserted and inj. Glycopyrrolate 4 mcg/kg, Fentanyl 2 mcg/kg i.v. and midazolam 0.03 mg/kg i.v. given. Patients were pre-oxygenated with 100% oxygen for 3 minutes. Anaesthesia was induced with propofol (2 mg/kg i.v.) after 2 ml of 1% lidocainei.v. to minimize propofol induced injection pain After loss of consciousness, ventilation of lungs was manually Assisted .followed by vecuranium bromide 0.1 mg/kg i.v. to facilitate tracheal intubation with an appropriate sized endotracheal tube. After intubation all study patients were randomized to receive either Sevoflurane 1%–2% inspired or desflurane 3%–6% inspired in a 50:50 N2O/oxygenmixture for initial maintenance of anesthesia at a total gas flow rate of 3 L/min as per randomization. The inspired concentrations of sevoflurane or desflurane was subsequently adjusted to maintain a clinically acceptable "depth of anesthesia" (i.e., providing good surgical conditions while maintaining a stable spontaneous respiratory rate, mean arterial blood pressure and heart rate values within 20% of the preinduction baselinevalues. Additional rescue bolus doses of fentanyl citrate 0.25-0.50 mcg/kg was administer to control acute haemodynamic changes not responding to a 50% increase in inspired concentration of the volatile drug. All patients were mechanically ventilated to maintain an end-tidal CO2 concentration at 32-36 mmHg. Muscle relaxation was maintained using intermittent doses of vecuranium bromide at appropriate intervals. Preventive analgesia was provided by using inj. Diclofenac2 mg/kg i.v. 30 minutes prior to operation. In all cases 10 minutes before extubation 4 mg i.v. ondansetron and 8 mg i.v. dexamatazone was administered for nausea-vomiting prophylaxis. The primary maintenance anaesthetic was discontinued at the end of the procedure and N2O was discontinued after the last skin suture. The gases was turned off abruptly and 100% oxygen was delivered at 6 L/min until eye opening. The neuromuscular block was reversed after return of spontaneous respiration with Neostigmine bromide 0.05 mg/kg and glycopyrrolate 0.08 mg/kg i.v. The tracheal tube was removed when the patient was fully conscious, breath spontaneously and have adequate motor recovery. Early recovery was assessed by recording the following time after discontinuation of the anesthetics, Time of Eye opening, Time of response to follow verbal command, Time of Extubation.[10] For intermediate recovery patients will be evaluated with the SPEEDS criteria immediately before leaving the operation theatre and in the PACU (post anaesthesia care unit) at [5,10,15,20,25,30] and 60 minutes post arrival.[11]Anesthesia time (from induction of anesthesia to discontinuation of sevoflurane or desflurane) and surgery time (from skin incision to placement of the dressing) was also recorded. all Patients where observed for nausea / vomiting, drowsiness, respiratory distress and pain postoperatively and treated with ondansetron hydrochloride dihydrate 0.1 mg/kg body weight IV, nebulisation with salbutamol sulphate 2.5 mg in 2.5 ml normal saline or fentanyl citrate 0.5 mg/kg body weight IV in case of these complications.

Statical Analysis

Results were expressed as mean SD (standard deciation). Statistical analysis was performed using unpaired student't' test. When p<0.0001 it is considered as statistically highly significant. Chi Square Test when P<0.05 it is considered as statistically significant

RESULTS

One hundred patients were recruited for the study. The two study groups were comparable with respect two demographic, characteristics, duration of anaesthesia and surgery (Table 1)

Table 1: Demographic Data

Particulars	Group S (n=50)	Group D (n=50)	P-Value
Age (years)	31.08 ± 9.13	28 ± 7.47	0.06
Sex(M/F)	16/34	10/40	
Weight (kg)	50.84 ± 10.60	50.32 ± 10.47	0.806
Duration of Anaesthesia	60.72 ± 31.53	64.24 ± 26.07	0.544
Duration of Surgery	53.68 ± 28.98	59.16 ± 23.72	0.303

Intraoperative hemodynamic parameters did not differ in the two groups during the course of anesthesia and were successfully maintained within 20% of baseline values with both anesthetics FIigure 1 and Figure 2 P>0.005 statistically not significant.

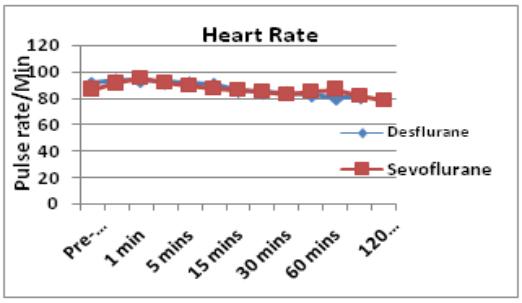

Figure 1: intraoperative heart rate

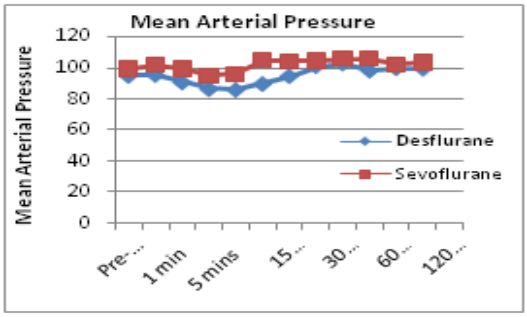

Figure 2: intraoperative Mean Arterial Pressure

After discontinuation of volatile anesthetic, the time to recovery of parameters like Time of Eye opening, Time of response to follow verbal command, Time of Extubation was significantly shorter in patients given desflurane than in patients given sevoflurane (P < 0.0001, [Table 2]).

Table 2: Early Recovery

		Group S (n=50)	Group D (n=50)	P-Value
Early Recovery	Time to Eye opening (min)	7.88 ± 1.59	4.48 ± 1.25	P < 0.0001
	Time to 1st respond to command (Squeeze Fingers) (min)	9.12 ± 1.47	5.56 ± 1.28	
	Time to Extubation (min)	9.16 ± 1.50	5.60 ± 131	

It is considered as statistically highly significant. Although the intermediate recovery, as assessed by the SPEEDS criteria was comparable between the two groups at [10,15,] [20,25,30,60] min. the score (SPEEDS criteria) immediately after extubation 0 min., 5 min. was statistically significant in desflurane group (P<0.05, [Table 3]).

Table 3: Intermediate recovery

Intermediate recovery		Group S (n=50)	Group D (n=50)	P-Value
Oriented to Place and Person	0 min After extubation	16	38	P = 0.03
	5 min	46	50	
	10 min	50	50	
Extremity movement (Moves all four)	0 min After extubation	16	38	P = 0.03

DISCUSSION

Advancement in surgical techniques and technology eg. (Laparoscopy) and advancement in anesthesia care (use of short acting anaesthetic agents) contributed to making ambulatory surgery easier. Both sevoflurane and desflurane have shorter emergence times compared to isoflurane based anaesthesia techniques. Because of its pharmacological properties, desflurane appears to yield a rapid early and intermediate recovery compared with sevoflurane. Sevoflurane and desflurane provided similar intraoperative conditions during the maintenance period.[2] The present study also demonstrates that both, desflurane and sevoflurane, provide comparable hemodynamic stability in patients undergoing laparoscopic surgical procedures. Mean arterial blood pressure and heart rate did not differ between the two groups, and were maintained within 20% of baseline values during the course of anesthesia. In our study, the early postoperative recovery was significantly rapid after desflurane anesthesia. The intermediate recovery as evaluated by speed criteria at O min. and at 5 min. also occurred earlier in the desflurane group. The lower fat/blood partition coefficient of desflurane, 27 vs. 48 for sevoflurane, should favour its early elimination from the body

resulting in early recovery.[3,4] the results of different studies have been conflicting. In our study, the early recovery parameters were achieved much faster in patients anesthetized with desflurane than with sevoflurane ($P < 0.0001$) which was highly statically significant and the intermediate recovery immediately after extubation 0 min., 5 min. was significant in desflurane group $P = 0.03$ which was statically significant. Our results show a statistical and clinical difference between the recovery profiles of patients who received desflurane versus sevoflurane. The limitation of our study was monitoring device of anaesthetic depth was not available we had to rely on slandered clinical indicter to titrate the maintenance anaesthetic as mentioned in methods, the recovery was assessed by using objective end points.

CONCLUSION

Our study showed that the emergence and early recovery time were shorter after maintance of anaesthesia with desflurane compared with that of sevoflurane after laparoscopic surgery. Intraoperative hemodynamic parameters was also similar in both the group. Thus it is concluded that early recovery from anaesthesia was more rapid after desflurane compared to sevoflurane however, intermediate recovery times after 5 min. were similar in the two groups

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