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ORIGINAL RESEARCH

A comparative study of emergence and recovery characteristics of sevoflurane versus desflurane in obese adult patients undergoing gastrointestinal surgery

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Abstract

Background: A favorable outcome after general anaesthesia is desired in obese patients in terms of emergence and recovery characteristics. Sevoflurane and Desflurane are characterized by low blood gas solubility coefficients which facilitates rapid induction and emergence from anesthesia. **Methods:** After Institutional ethics committee clearance and written informed consent, 128 patients were randomized and received Sevoflurane and Desflurane with BIS[Bi spectral Index] guided maintenance of anesthesia .We compared the intraoperative hemodynamic parameters, emergence and post operative recovery characteristics of sevoflurane versus desflurane in adult obese patients undergoing gastrointestinal surgery. **Results:** In this study Desflurane demonstrated faster emergence and recovery time compared to Sevoflurane. Hemodynamic stability was maintained in both groups with comparable heart rate and blood pressure. **Conclusion:** Desflurane allows for faster emergence and recovery than sevoflurane in obese patients undergoing gastrointestinal surgery, making it a preferrable choice for such procedures.

Keywords: Anaesthesia for obese, GI surgeryDesflurane, Sevoflurane, BIS.

INTRODUCTION

The management of anaesthesia in obese patients presents unique challenges due to the physiological changes associated with obesity, including alterations in respiratory and cardiovascular function.These patients are at an increased risk of perioperative complications, which necessitates careful consideration of anaesthetic agents to ensure rapid and smooth emergence from anaesthesia, as well as a swift recovery.**[**1]

The selection of inhalational anaesthetics plays a crucial role in influencing these outcomes. The presence of excess fat tissue in obese patients combined with high lipophilicity result in the increased release of inhalation agents.[2]

Obese patients can have a good recovery after general anaesthesia if they are awake, stable, and can maintain their breathing after surgery. The way drugs behave in the body can vary between obese and non-obese patients, influenced by both the patient's obesity and the specific drug being used.[3]

Both fat and lean body massincrease, but the proportion of lean body mass decreases.[4] Compared to non-obesepeople, obese patients have less water content and reduced blood flow per gram offat tissue. Because of these changes, obesity makes the partition coefficients(blood/gas, oil/gas) of inhaled drugs more important, especially as body weight andthe duration of anaesthesia increase.[5]

Lean tissues, like the heart, kidneys, and muscles, get most of the blood flow but don't absorb anaesthetics as readily as fat does. As a result, anaesthetic levels balance out in these tissues within minutes, while it takes hours for fat to reach equilibrium[6]. Because fat has a high capacity for anaesthetics and low blood flow, it takes longer for the anaesthetic levels to stabilize there. Even after stopping the anaesthetic, fat continues to absorb it, which can speed up recovery.[7]

This study aimed to compare the emergence and recovery characteristics of sevoflurane versus

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desflurane in obese patients undergoing gastrointestinal surgery.

MATERIALS AND METHODS

The study was a hospital based, single blinded randomized comparative study carried out in obese patients undergoing gastrointestinal surgery under GA at department of Anaesthesia, NIMS university, Jaipur. The study was conducted after approval of ethics committee and research review board of the institutionand consists of 128 patients with 64 in each group required at 95% confidence interval.

ASA I, II patients, undergoing laparoscopic cholecystectomy were randomly assigned to receive desflurane (n = 64) or sevoflurane (n = 64), using Bispectral Index System (BIS) to determine the depth of anaesthesia. An independent adjudicator, who was blinded to the agent used, recorded the events during the recovery phase. The time required for extubation, eye opening, verbal response and achievement of a modified Aldrete score of 9 were recorded.

Pre anaesthetic checkup was done a day before surgery, informed written consent for procedure and future use of data for publication was taken.detailed history was taken, vitals, weight and height were recorded and BMI calculated.complete systemic examination was performed, airway was also assessed and nil by mouth instructions were given to patients as per fasting guidelines.All routine investigations CBC, LFT ,RFT ,Coagulation profile, fasting blood sugar, ECG, chest X-ray were done.

On the day of surgery, after confirming fasting of patient, patient was taken on the operation table,monitors were connected and baseline vitals were recorded, 18G cannula was secured and crystalloid fluid were started.After induction of anaesthesia, airway is secured with endotracheal tube and injection atracurium is given. Patient is then ventilated using closed circuit and mechanical ventilator. End tidal capnometry and anaesthetic gas monitoring is to be instituted and patients will subsequently receive either sevoflurane or desfluranewith air in oxygen with fresh gas flow. Anaesthesia was maintained according to BIS value between 45-55. Monitoring was done using SpO2, NIBP, ECG, HR, EtCO2, and anaesthetic gas monitoring.The primary anaesthetic will be discontinued after last skin suture is placed. The neuromuscular block will be reversed, All the parameters will be recorded intra operatively and until the patient achieved an Aldrete score of 9 (30 minutes post operatively). Also, the time of the first incidence of eye opening, that of first verbal response and any untoward events if any did occur, in the form of excessive secretions, coughing or bronchospasm.

RESULTS

Table 1: Demographic and Anthropometric details of the subjects enrolled in the study

VARIABLE	Sevoflurane	Desflurane	Total
Subjects	64	64	128
Age	47.03 ± 13.24	46.00 ± 11.88	46.52 ± 12.54
Gender [M/F]	21/43	25/39	46/82
BMI	31.90 ± 0.21	31.99 ± 0.73	31.94 ± 0.01

Table 2: Clinical parameters of the subjects enrolled in the study

Variable	Sevoflurane	Desflurane	Total
Duration of Anesthesia (Mean ± SD), minutes	108.50±32.32	114.20 ± 32.80	111.35 ± 32.56
Duration of Surgery (Mean ± SD), minutes	98.44 ± 32.09	103.11 ± 32.70	100.77 ± 32.36

Table 3: Heart rate of the subjects at various stages of the surgical procedure

Variable	Sevoflurane	Desflurane	Total	p-value
HR Pre-Induction (Mean ± SD)	82.80 ± 10.69	83.95 ± 11.77	83.38 ± 11.21	0.562
HR At Intubation (Mean ± SD)	107.48 ± 9.31	108.45 ± 8.55	107.97 ± 8.92	0.541
HR At Skin Incision (Mean ± SD)	86.91 ± 13.97	86.05 ± 18.11	86.48 ± 16.12	0.764
HR 5min (Mean ± SD)	86.28 ± 7.89	86.23 ± 8.01	86.26 ± 7.92	0.973
HR 15min (Mean ± SD)	84.22 ± 8.89	83.77 ± 8.53	83.99 ± 8.68	0.769
HR 30min (Mean ± SD)	83.66 ± 8.67	82.30 ± 7.89	82.98 ± 8.29	0.355
HR 60min (Mean ± SD)	83.73 ± 14.22	81.64 ± 13.66	82.69 ± 13.93	0.397

Table 4: Systolic Blood Pressure of the subjects at various stages of the surgical procedure

Variable	Sevoflurane	Desflurane	Total	p-value
SBP Pre-Induction (Mean ± SD)	129.56 ± 5.26	129.72 ± 5.21	129.64 ± 5.22	0.866
SBP At Intubation (Mean ± SD)	129.88 ± 6.77	129.59 ± 6.84	129.73 ± 6.78	0.816
SBP At Skin Incision (Mean ± SD)	132.31 ± 4.95	132.48 ± 4.74	132.40 ± 4.83	0.841
SBP 5min (Mean ± SD)	126.59 ± 5.58	126.56 ± 5.55	126.58 ± 5.54	0.975
SBP 15min (Mean ± SD)	130.42 ± 6.13	131.63 ± 4.94	131.02 ± 5.58	0.224

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SBP 30min (Mean ± SD)	**130.34 ± 5.88**	**127.22 ± 6.15**	**128.78 ± 6.19**	**0.004**
SBP 60min (Mean ± SD)	**130.81 ± 5.83**	**131.36 ± 5.96**	**129.84 ± 6.07**	**0.421**

Table 5: Diastolic Blood Pressure of the subjects at various stages of the surgical procedure

Variable	Sevoflurane	Desflurane	Total	p-value
DBP Pre-Induction (Mean ± SD)	**84.61 ± 5.35**	**84.58 ± 5.22**	**84.59 ± 5.27**	**0.973**
DBP At Intubation (Mean ± SD)	**88.56 ± 5.75**	**88.73 ± 5.70**	**88.65 ± 5.70**	**0.865**
DBP At Skin Incision (Mean ± SD)	**85.31 ± 5.92**	**85.41 ± 5.95**	**85.36 ± 5.91**	**0.929**
DBP 5min (Mean ± SD)	**85.78 ± 5.82**	**85.88 ± 5.96**	**85.83 ± 5.87**	**0.928**
DBP 15min (Mean ± SD)	**85.66 ± 5.92**	**85.41 ± 5.92**	**85.53 ± 5.90**	**0.811**
DBP 30min (Mean ± SD)	**87.55 ± 6.29**	**87.59 ± 6.20**	**87.57 ± 6.22**	**0.966**
DBP 60min (Mean ± SD)	**86.02 ± 6.14**	**85.63 ± 6.09**	**85.82 ± 6.09**	**0.718**

Table 6: Variance of responses among subjects in both the groups.

Variable	Sevoflurane	Desflurane	Total	p-value
Response to Stimulus	**5.19 ± 1.56**	**3.73 ± 0.67**	**4.46 ± 1.40**	**0.00**
Response to verbal commands	**6.66 ± 1.86**	**5.02 ± 0.81**	**5.84 ± 1.65**	**0.00**
Spontaneous eye opening	**7.73 ± 2.26**	**5.75 ± 0.87**	**6.74 ± 1.97**	**0.00**
Time of extubation	**9.58 ± 2.45**	**7.31 ± 1.34**	**8.45 ± 2.27**	**0.00**
Recall of Name	**11.54 ± 1.28**	**8.95 ± 1.16**	**10.24 ±1.78**	**0.00**
PARS 9	**14.38 ± 1.42**	**12.03±1.30**	**13.20 ±1.79**	**0.00**

Table 7: Airway side effects

ADVERSE EFFECTS	GROUP D[n=64]	GROUP D[n=64]
COUGH GRADE 1	**12**	**1**
PONV	**6**	**5**
LARYNGOSPASM	**0**	**0**

DISCUSSION

The demographic and anthropometric data shown in Table 1 provide a comprehensive overview of the patient population, highlighting a well-balanced distribution between the sevoflurane and desflurane groups. This demographic and anthropometric balance ensures that the subsequent findings regarding the efficacy and safety of sevoflurane and desflurane are both valid and generalizable to a similar patient population. Thus, any differences observed in the recovery and clinical parameters can be attributed with greater confidence to the properties of the anaesthetics agents themselves rather than to underlying demographic or physiological disparities.

Clinical parameters, including the duration of anaesthesia and surgery, showed slight variations between the two groups, with the desflurane group experiencing marginally longer times compared to the sevofluranegroup.these differences were not statistically significant, suggesting that the two groups were subjected to comparable surgical conditions.

The heart rate data from this study indicate no significant differences between the sevoflurane and desflurane groups at various stages of the surgical procedure, as presented in Table 3. Specifically, the mean heart rates were comparable between the two groups before induction (82.80 ±10.69 bpm for sevoflurane and 83.95 ±11.77 bpm for desflurane), at intubation (107.48 ±9.31 bpm for sevoflurane and 108.45 ±8.55 bpm for desflurane), and at multiple intervals during the surgery, such as at skin incision, 5 minutes, 15 minutes, 30 minutes, and 60 minutes into the procedure.

The systolic blood pressure (SBP) measurements in this study were generally comparable between the sevoflurane and desflurane groups, as shown in Table 4. the diastolic blood pressure (DBP) readings exhibited no significant differences between the sevoflurane and desflurane groups at any measured interval, as depicted in Table 5. This consistent finding reinforces the effectiveness of both anaesthetics agents in maintaining stable hemodynamic conditions throughout the surgical procedure.

The variance in recovery times across various parameters reveals a notable advantage for desflurane over sevoflurane. The data indicates that patients in the desflurane group experienced significantly faster recovery times in several key areas: response to stimulus, response to verbal commands, spontaneous eye opening, time to extubating, recall of name, and the Post-Anaesthesia Recovery Score (PARS) at 9 minutes (Table 6).

Desflurane showed significantly faster times in response to stimulus (3.73 ±0.67 minutes) compared to sevoflurane (5.19 ±1.56 minutes, $p < 0.01$), and extubation time was shorter withdesflurane (7.31 ± 1.34 minutes) than sevoflurane (9.58 ±2.45 minutes, $p < 0.01$).

The statistically significant differences across all parameters highlight the potential advantages of Desflurane in promoting quicker emergence and

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recovery in obese adult patients undergoing gastrointestinal surgery.

Cough of Grade 1 was noted in12 in patients in Desflurane group and 1 in Sevoflurane group with a significant p value of 0.03.

These findings are particularly relevant in the context of obese patients, who are often prone to extended recovery times due to their physiological characteristics. The quicker emergence from anaesthesia facilitated by desflurane can significantly enhance patient outcomes by reducing the length of postoperative care and minimizing the risk of complications associated with prolonged anaesthesia. Faster recovery times also contribute to a more efficient turnover in surgical settings, potentially improving the overall efficiency of surgical procedures

CONCLUSIONS

The results of this study illustrate that both sevoflurane and desflurane are effective in maintaining stable hemodynamic conditions throughout surgery, with no significant differences in heart rate, diastolic blood pressure, and most systolic blood pressure measurements between the two anaesthetics agents. However, the study highlights a distinct advantage for desflurane in terms of faster recovery times.

Desflurane was associated with significantly quicker responses to stimuli, faster recovery of cognitive functions, and shorter times to extubating compared to sevoflurane.

These benefits make desflurane particularly advantageous for obese adult patients undergoing gastrointestinal surgery, as it facilitates a more rapid emergence from anaesthesia. The faster recovery can lead to improved postoperative outcomes, a reduction in the duration of postoperative care, and enhanced overall surgical efficiency. Consequently, desflurane may be a more suitable choice for anaesthetics management in this patient population, offering both clinical and operational benefits

Conflicts of Interest: The authors have no conflict of interest.

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