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A Observational Study of Desflurane Versus Sevoflurane in Obese Patients Undegoing Laparoscopic Surgery

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KEYWORDS

Anaesthesia, morbidly obese, anaesthetics volatile, sevoflurane, desflurane, recovery, early, intermediate.

ABSTRACT:

INTRODUCTION

Obesity is a significant health concern worldwide, and its prevalence has been steadily increasing over the past few decades. Obese individuals often require surgical interventions for various medical conditions, including laparoscopic procedures. Anaesthesia management plays a crucial role in ensuring patient safety and optimizing surgical outcomes in this population. Anaesthesia in obese patient is difficult due to associated multimorbidity and modified physiology.

Inhaled volatile anaesthetics, such as desflurane and sevoflurane, are commonly used in general anaesthesia for laparoscopic surgery. Both agents have desirable characteristics, including rapid onset and offset, minimal metabolism, and low tissue solubility. However, their effects and considerations may differ in obese patients due to physiological and pharmacokinetic alterations associated with obesity.

Desflurane and sevoflurane have a low-fat-blood solubility hence, the results in a moderately rapid induction, recovery and rate of change of anaesthetic depth differs. Desflurane has a blood gas solubility coefficient of 0.42 the lowest of all the inhalational agent which recovery should occur rapidly. The agent has advantage when used in extreme of age and in the obese. Sevoflurane is an ether inhalational agent with non-inflammable compound with low solubility profile and blood gas partition co efficient. The motive of the study is to compare desflurane and sevoflurane unique properties that influence the time taken for recovery and the hemodynamic changes the occurs to their obese patient undergoing laparoscopic surgery

AIM

The main aim of this study is to evaluate and compare desflurane and sevoflurane in obese patient undergoing laparoscopic surgery.

METHODOLOGY

The study was conducted in 40 patients belonging to either gender. After obtaining informed concern from each patient, the patients were selected and divided into two, Group D and Group S, each group containing 20 patients.

Group D was given Desflurane and Group S was given Sevoflurane.

RESULTS

Intraoperative MAP and HR did not differ between the two groups. The time to response to painful stimuli, obeying verbal commands and spontaneous eye opening, limb elevation and ability to

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cough and swallow was shorter in desflurane anaesthesia than sevoflurane.

CONCLUSION

Both desflurane and sevoflurane produce similar hemodynamic changes but the immediate and intermediate recovery was significantly faster after desflurane thus contributing to fast tracking and early discharge of patients.

INTRODUCTION

While there are many types and levels of anaesthesia — medication to keep you from feeling pain during surgery — general anaesthesia is most commonly used for major operations, such as knee and hip replacements, heart surgeries, and many types of surgical procedures to treat cancer. Many of these surgeries are lifesaving or life-changing and would not be possible without general anaesthesia.

General anaesthesia is medicine that is administered by an anaesthesiologist, a medical doctor, through a mask or an IV placed in the vein. While the anaesthesia is working, you will be unconscious, and many of your body's functions will slow down or need help to work effectively. A tube may be placed in your throat to help you breathe. During surgery or the procedure, the anaesthesiologist will monitor your heart rate, blood pressure, breathing, and other vital signs to make sure they are normal and steady while you remain unconscious and free of pain.

Once your surgery is complete, your anaesthesiologist will reverse the medication and be with you as you return to consciousness, continually monitoring your breathing, circulation, and oxygen levels. Some patients feel fine as they wake up; others experience symptoms such as nausea, vomiting, or chills. Your throat may be sore from the breathing tube. Your anaesthesiologist will help you manage these symptoms.

Because you've had major surgery, you probably will have pain and discomfort from the procedure as you recover, which might get worse as the effects of the general anaesthesia wear off. Your anaesthesiologist will advise you about how to manage your pain during recovery in the hospital and at home [3]

A favourable outcome after general anaesthesia in obese patients can be achieved once these patients are awake, conscious, pain free, hemodynamically stable and are able to maintain their respiratory functions postoperatively.

Inhalation anaesthetics (nitrous oxide, halothane, isoflurane, desflurane, sevoflurane, most commonly used agents in practice today) are used for induction and maintenance of general anaesthesia in the operating room.

This review is a general overview of inhalation anaesthetic agents. Inhalation anaesthetic agents are medications primarily used in the operating room to provide general anaesthesia for surgery. This activity describes the indications, action, and contraindications for the use of inhalational anaesthetic agents. This activity will also highlight the mechanism of action, adverse event profile, and other key factors (e.g., off-label uses, dosing, pharmacodynamics, pharmacokinetics, monitoring, relevant interactions) pertinent for members of the interprofessional healthcare team in providing general anaesthesia.

The exact mechanism of action for inhaled anaesthetics remains mostly unknown. Fundamentally, inhaled anaesthetics work within the central nervous system by augmenting signals to chloride channels (GABA receptors) and potassium channels while depressing neurotransmission pathways. These pathways, including acetylcholine, both the muscarinic and nicotinic receptors, glutamate or NMDA receptors, and serotonin (5-HT receptors). Inhalation agents are also sub-classified as either volatile and non- volatile. Isoflurane, sevoflurane, and desflurane all decrease systemic blood pressure by decreasing systemic vascular resistance. For the most part, these agents preserve cardiac output, but cardiac depression can be seen if combined with other IV agents or in patients with acute cardiogenic shock. Desflurane has been known to cause hypertension and tachycardia with rapid administration of the agent. Nitrous oxide can cause myocardial depression, but this effect is offset by the sympathetic increasing leading to minimal hemodynamic changes.

Volatile anaesthetic agents are not true respiratory depressant drugs in the sense that they decrease the respiratory rate seen by other agents. They do decrease tidal volumes but with the respiratory rate increase. This is not equally matched; therefore, the minute ventilation can decrease. [4]

All volatile anaesthetics accumulate in adipose tissues and skeletal muscles which delays recovery from anaesthesia as the anaesthetic agent stored in fat returns to blood perfusing the fat or to its adjacent highly perfused

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tissues (e.g., omental/mesenteric fat to intestine and liver). Desflurane and sevoflurane have significantly lower blood/gas partition coefficients (0.45 and 0.65, respectively) which allows for rapid titration and emergence at the end of surgery.
Desflurane has been associated with faster emergence time when compared to isoflurane in the obese patient, which would be expected based on lower blood-gas and fat-blood solubility coefficient; however, only a little data is available on its comparison with sevoflurane in obese patients. Sevoflurane also has a lower blood-gas solubility and a faster emergence profile compared with isoflurane in the obese patient, despite similar fat-blood solubility. These findings lead to speculation that blood-gas solubility, rather than fat solubility, may be the dominant force influencing the speed of recovery in obese patients.

The trend of laparoscopic abdominal surgeries is increasing in today's era as these are associated with improved surgical outcome, reduced postoperative complications like pain, infections, and decreased duration of hospital stay. To have a better outcome of laparoscopic surgeries in obese patients, the importance lies in the choice of more desirable anaesthetic agent for induction and emergence. Hence, we conducted this prospective, randomized single-blind study to find out a more desirable inhalational anaesthetic agent in regards to recovery profile indices and cognitive function of obese patients undergoing laparoscopic abdominal surgeries(5).
The main aim of the study is to evaluate and compare desflurane and sevoflurane in obese patient undergoing laparoscopic surgery. The study also determines the rapid recovery from general anaesthesia and hemodynamic changes of desflurane versus sevoflurane in obese patient undergoing laparoscopic surgery. [(5)]

MATERIALS AND METHODS
This study was done in Sree Balaji Medical College and Hospital during the year 2023. The study was conducted on 40 patients of both genders and age group between 20 - 60years old were taken from ethical and research committee Of Sree Balaji Medical College and Hospital and written consent was taken from all patient.
Inclusion Criteria: Patient who will receive Desflurane and Sevoflurane undergoing laparoscopic surgery,AGE: 35 - 60 years of age,ASA: ASA II and ASA III patient,GENDER: Male and Female Exclusion Criteria: Patient above 60 years of age, ASA IV and above, Patient refusal, Pre-existing medical conditions like cardio-vascular liver or kidney dysfunction, bleeding disorder, neurological disorder or uncontrolled diabetes. The study had a 6 Months of study period

Methodology
1. After obtaining approval from ethical committee and written informed consent ASA grade I and II patient of either gender age 35 -60 years old was scheduled for laparoscopic surgery performed under General Anaesthesia alone.
2. The patient was randomly divided into two groups, Group D and Group S Group D received desflurane
Group S received sevoflurane

3. Selected patient was advised to be on NPO for 8 hours, procedure details were explained to patient in their mother tongue and consents were taken.
4. After examining the pre-operatively patient was taken into the operation theatre**.**

5. IV access was secured and monitoring devices was properly connected to patient. Monitoring parameters such as heart rate, oxygen saturation, and blood pressure were recorded for every 15 minutes.
6. Patients were randomized to receive either desflurane or sevoflurane as a part of a standardized general anaesthesia technique.
7. The following variables were observed;

- Hemodynamic variables like heart rate, blood pressure, saturation was observed and noted preoperatively, at induction and intubation, then at regular intervals.
- Recovery was assessed by time taken for eye opening on verbal command, extubation, orientation to time, place, and person after discontinuation of volatile anaesthetic agent and head lift.
- In post anaesthesia care unit, intermediate recovery was assessed by ability to breath and ability to cough and swallow.

The data was tabulated in Microsoft Excel worksheet and computer-based analysis was performed using the Statistical Package Social Science Software and Microsoft Excel 2021. Results on continuous measurements are presented as Mean ± SD (Standard Deviation). All other demographic data and intra-operative vitals were observed using student's 'T – test'.

For all analysis, Value of $P < 0.05$ is considered as significant and Value of $P > 0.05$ is considered as non-significant.

RESULT
When Demographics variables were compared , Both groups were comparable in age, gender, BMI, and ASA status.
Hemodynamic Stability had No significant difference in mean HR and BP intraoperatively(fig 1)

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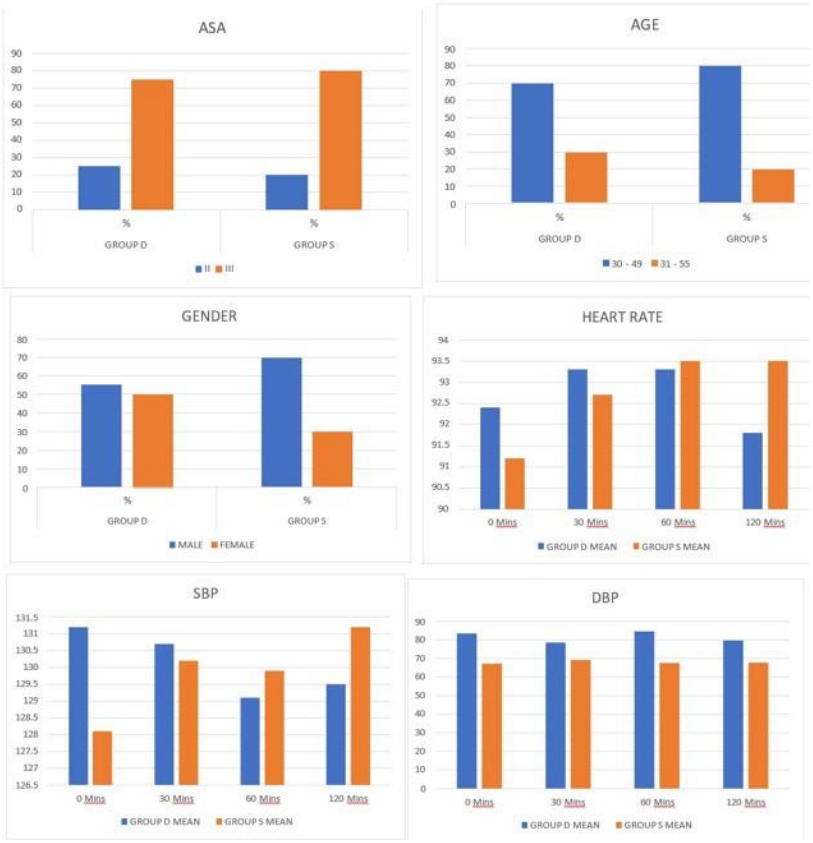

Fig 1

ASA, AGE, GENDER,HEART RATE,SBP,DBP

Compared across two group

When we compared the Recovery status Desflurane group had faster emergence:
Eye opening (6.1 ± 1.2 min vs. 9.3 ± 1.5 min), Verbal command response (6.8 ± 1.1 min vs. 10.2 ± 1.6 min), Extubation time (7.5 ± 1.4 min vs. 11.1 ± 1.8 min).

Table 1

RECOVERY CRITERIA	GROUP S	GROUP D	P VALUE	SIGNIFICANCE
	MEAN ± SD	MEAN ± SD		
RECOVERY TIME	136.4 ± 4.2	152 ± 7.40	P < 0.0001	SIGNIFICANT

RECOVERY CRITERIA	GROUP S	GROUP D	P VALUE	SIGNIFICANCE
	MEAN ± SD	MEAN ± SD		
EYE OPENING	3.5 ± 0.5	1.6 ± 0.48	P < 0.0001	SIGNIFICANT
VERBAL RESPONSE	3.7 ± 0.69	1.9 ± 0.76	P < 0.0001	SIGNIFICANT
MOTOR RESPONSE	5 ± 0.83	2.45 ± 0.49	P < 0.0001	SIGNIFICANT

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DISSCUSSION

Since the 1980s, minimally invasive techniques have been applied to an increasing number and variety of surgical procedures with a gradual increase in the complexity of procedures being successfully performed laparoscopically. In the past, obesity was considered a contraindication to laparoscopy due to the higher risk of co-morbid conditions such as diabetes, hypertension, coronary artery disease and venous thromboembolism. Performing laparoscopic gynaecological procedures in morbidly obese patients is no longer a rare phenomenon; however, it does necessitate changes in clinical practice patterns. Understanding of the physiological changes induced by laparoscopy, particularly in obese patients, is important so that these may be counteracted and adverse outcomes avoided. Laparoscopy in obese patients confers certain advantages such as early ambulation, less post-operative pain, short hospital stays. In addition to these benefits, minimal-access surgery has been demonstrated as safe and effective in obese patient: Because of less handling of internal organs and hence less chance of wound infection. (6)

Since the first laparoscopic hysterectomy reported by Reich et al., many surgeons worldwide have demonstrated that this technique is both feasible and reproducible. The risk of major operative complications in laparoscopic hysterectomy remains low, and it is considered suitable. Obesity is on the rise and gynaecological surgeons are more than likely expected to treat an increasing number of obese patients. Laparoscopy is not contraindicated in obese patients, and despite being associated with increased operating times in cases of complex surgical, due to life style modification, obesity is on raise (7)

Recovery is a continual and ongoing process and is divided into three phases: Early recovery, as the patient emerges from anaesthesia and regains vital reflexes; intermediate recovery, when the patient achieves criteria for discharge from the PACU; and late recovery, when the patient returns to his or her preoperative physiological state. Early and complete recovery after general anaesthesia is desirable in all patients, more so in the morbidly obese patients.

All volatile anaesthetics accumulate, over time, in adipose tissue. Such accumulation may delay recovery from anaesthesia. The impact of anaesthetic stored in fat may be exaggerated in morbidly obese patients, particularly after prolonged anaesthesia. (8) This study was undertaken to compare to determine the rapid recovery from general anaesthesia and hemodynamic changes of desflurane versus sevoflurane in obese patient undergoing laparoscopic surgery.

The patient was divided into two groups (20 patients in each group), Group D receiving Desflurane and Group S receiving Sevoflurane. The study groups were comparable regarding demographic variables such as age, gender, ASA grading. Desflurane provided a smooth intra-operative analgesia as compared to sevoflurane which is evident from the results. Regarding the Recover time Kaur, A (1) observed that the early recovery parameters were achieved much faster in patients anesthetized with desflurane than with sevoflurane (P = 0.001).

In our study the recovery time of Desflurane was 152 ± 7.40 and the recovery time for Sevoflurane was 136.4 ± 4.2 which is longer compared to Desflurane. The difference between the two groups was significant (p value < 0.001). Our study thus correlated with the above study group.Regarding the Eye-Opening Kaur, A (1) observed that the eye opening for desflurane group is 3.75 ± 2.3 and for Sevoflurane group 8.5 ± 5.708 (p value <0.001)

In our study the eye opening of desflurane group was 3.5 ± 0.5and for sevoflurane it was 1.6 ± 0.48 which is longer than desflurane. The difference between the two groups was significant (p value < 0.001). Our study thus correlated with the above study group. Regarding the Verbal Response Kaur, A (1) observed that verbal response for desflurane group is 3.45 ± 2.1 and for sevoflurane 7.45 ± 4.54 (p < 0.001).

In our study the verbal response of desflurane group was 3.7± 0.69 and for sevoflurane 1.9 ± 0.76, which is longer than desflurane. The difference between the two groups was significant (p value < 0.001). Our study thus correlated with the above study group.

Regarding the Motor Response Kaur, (1) observed that the desflurane 5.395 ± 7.5 for lift limb and for Sevoflurane 13.4 ± 7.97 (p = 0.071)

In our study the motor response for desflurane 5 ± 0.83 and for sevoflurane 2.45± 0.49, which was shorter than sevoflurane. The other study did not show any difference in Motor response, but in our study, it was achieved much faster in patients anesthetized with desflurane than with sevoflurane (p value < 0.001).

Our results show a statistical and clinical difference between the recovery profiles of patients who received desflurane versus sevoflurane. The data is consistent with the faster kinetic profile of desflurane and its faster wash out from the body. Faster washout and recovery times have been demonstrated with desflurane using inhalation bolus technique to optimize anesthetic administration to morbidly obese patient. Use of desflurane is also

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associated with a more rapid initial awakening, less depression of cognitive function and less impairment of psychomotor performance. [7]

In summary, we found that both desflurane and sevoflurane provide similar intraoperative hemodynamic stability but desflurane is associated with faster emergence and recovery in morbidly obese patients. The more predictable and rapid recovery after desflurane might have a significant beneficial effect on postoperative morbidity in the obese population. Although the findings of different studies are conflicting and we could not find any study on recovery of cognitive function in obese patients.

CONCLUSION

In our study the basis of the findings of our present observational, we come to the conclusion that the both desflurane and sevoflurane produce similar hemodynamic changes but the immediate and intermediate recovery was significantly faster after desflurane thus contributing to fast tracking and early discharge of patients.

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