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Original Article

To compare intra operative hemodynamics and postoperative nausea and vomiting in Middle Ear Surgeries with Sevoflurane and Desflurane

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ABSTRACT

Aim: To compare intraoperative hemodynamics and postoperative nausea and vomiting in Middle Ear Surgeries with Sevoflurane and Desflurane **Materials and methods:** Patients were included in the study if they were scheduled to undergo elective middle ear surgeries (such as tympanoplasty, mastoidectomy, osseous chain reconstruction, stapedectomy, cochlear implants, etc.) under general anaesthesia and fell within the age range of 12 to 60 years old. Patients could be of either gender. Patients had to be willing to participate. Patients were randomly assigned to one of two groups, Group S (n-50) or Group D (n-50), using a straightforward randomization procedure that was based on the inhalation medication that was used for the maintenance of anaesthesia.**Results:** The difference in age group of the study participants are comparable and statistically insignificant. The differences in intraoperative hemodynamics, measured in terms of systolic blood pressure, diastolic blood pressure, and heart rate, were similar between the two groups, and there was statistically no significance 'p' value >0.05 from the preoperative period through the completion of the operation. The differences in the duration of surgery and anaesthesia between groups S and D were comparable and statistically insignificant, with p values of 0.41 and 0.26 respectively. The mean duration of surgery and anaesthesia in groups S and D were respectively 83.8±9.41 minutes, 106.14±7.41 minutes, and 86.36±7.63 minutes, 105.36±6.36 minutes.**Conclusion:** Both sevoflurane and desflurane, when used as maintenance agents in middle ear procedures, did an equally good job of maintaining a stable intraoperative hemodynamics, and there was no significant difference in the incidence of post-operative nausea and vomiting between the two.

Keywords: Desflurane , Middle ear surgeries , Postoperative nausea and vomiting(PONV) , Sevoflurane

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INTRODUCTION

Before leaving the skull via the stylomastoid foramen, the facial nerve travels through the air-filled area of the middle ear, which is located between the tympanic membrane and the oval window [1,2]. Surgical procedures performed on the middle ear are greatly impacted by the anatomical and functional features of the patient. During the perioperative phase, extreme caution is required given the peculiarities of the middle ear, including its size and the sensitive nature of its contents. The provision of a bloodless surgical field, careful attention to the positioning of the patient's head, management of the airway, the effect of nitrous oxide on the middle ear, the absence of fluctuations in intratympanic pressure, a smooth and fast emergence, a calm recovery, and the prevention of postoperative nausea and vomiting (PONV) are all special considerations that need to be taken into account [3-6].

In the field of anaesthesia, the introduction of newer inhalational agents such as sevoflurane and desflurane marked the beginning of a new era known as fast tracking. These agents have gained popularity and convenience due to their ability to maintain hemodynamic stability, emerge from anaesthesia, and recover more quickly than older agents. Surgery on younger patients, stimulation of the vestibular system, and suction irrigation (a caloric vestibular stimulant) are all factors that may contribute to the high incidence of postoperative nausea and vomiting (PONV) that is associated with middle ear surgery. The incidence of postoperative nausea and vomiting (PNOV) may vary depending on the type of anaesthetic that is administered. PONV is a substantial contribution to the increased expenditures of health care for hospitals as well as individual patients [7]. achieving a more effective outcome with respect to PONV is desirable because it has the potential to affect surgical repair and will become increasingly important in the future as a result of increasing pressure to decrease discharge times. This is because longer recovery times, as well as

unanticipated admissions following procedures, contribute to the problem. In addition, a more effective outcome with respect to PONV is desirable because it can affect surgical repair. Comparative research into the effects of the inhalation agents desflurane and sevoflurane on intraoperative hemodynamics as well as postoperative nausea and vomiting during middle ear procedures is the focus of this study.

MATERIALS AND METHODS

The current investigation was a clinical research that was authorised by the Institutional Ethics Council and was prospective, randomised, and comparative in nature. It was carried out at the ENT department. Patients were included in the study if they were scheduled to undergo elective middle ear surgeries (such as tympanoplasty, mastoidectomy, osseous chain reconstruction, stapedectomy, cochlear implants, etc.) under general anaesthesia and fell within the age range of 12 to 60 years old. Patients could be of either gender. Patients had to be willing to participate. Every patient who participated in the research was given comprehensive information on the operation, and their written consent along with their informed consent was acquired. Patients were randomly assigned to one of two groups, Group S (n-50) or Group D (n-50), using a straightforward randomization procedure that was based on the inhalation medication that was used for the maintenance of anaesthesia.

INCLUSION CRITERIA

ASA Classes I and II, Patients Aged 12 to 60 Years Old, with Middle Ear Elective Surgeries Lasting Between 60 Minutes and 2 Hours

EXCLUSION CRITERIA

- Having had general anaesthesia during the preceding week, disorders of the neuropsychiatric system,
- Pregnancy and Breastfeeding, as well as a resting heart rate of less than sixty beats per minute
- Badeline Blood pressure <100/50mmHg,
- Individuals with a BMI greater than 30 and those who have hearing loss

Before surgery, each participant in the research was given an evaluation, evaluated, and detailed investigation; they were also given information about the procedure, and their signed and informed permission was acquired. On the day of the procedure, the operating room was stocked with ready-to-use anaesthetic equipment, including a workstation for administering anaesthesia, airway equipment, suction gear, and an emergency crash trolley. An intravenous access was established on the patient's left forearm using an 18-gauge intravenous cannula, and a Ringers lactate infusion was started at a rate of 3 millilitres per kilogramme of the patient's body weight immediately after the patient was brought into the operating room. Both of the research groups were given the standard amount of general anaesthesia, which included glycopyrrolate 0.2 milligrammes, fentanyl 2 micrograms per kilogramme, ondansetron 4 milligrammes, and propofol induction at a dose of 2 milligrammes per kilogramme. Endotracheal intubation was facilitated with suxamethonium (1.5 mg/kg), and an appropriately sized oral cuffed endotracheal tube was passed. Lungs were ventilated mechanically with 33:66 O2/N2O using a closed circle system, FGF @ 5L/min, vecuronium for muscle relaxation, and maintenance of oxygenation and ventilation were also performed. Group S was given sevoflurane at a concentration of 1% to 2%, whereas group D was given desflurane at a concentration of 4% to 6%. Once the treatment was finished, the inhalational anaesthetic was stopped, and the nitrogen oxide was also stopped after the last skin suture was applied. After the conclusion of the surgical procedure, residual neuromuscular blockade was reversed by administering Neostigmine 60 gkg-1 and glycopyrrolate 10 gkg-1 intravenously. Intraoperative monitoring included noninvasive blood pressure (NIBP), heart rate, and oxygen saturation recorded at predetermined time intervals prior to surgery (baseline), at intubation for five minutes, ten minutes, fifteen minutes, and thirty minutes, and then every thirty minutes after that until the surgery was finished. Postoperatively, patients were moved to the after anaesthesia care unit (PACU) following extubation and complete recovery. Incidents of postoperative nausea and vomiting were documented during the first twenty-four hours after surgery. Complaints from patients or questionnaires filled out by patients were used to identify episodes of PONV. There is no difference between the symptoms of nausea, vomiting, and retching.

STATISTICAL ANALYSIS

The statistical analysis was carried out using statistics package for social sciences version 1.6 after the data were compiled in an Excel sheet during collection. Quantitative data were reported using mean and standard deviation, whilst qualitative data were conveyed using frequencies and percentages. For comparing the trends of all parameters between the two groups, an unpaired t test was used as the statistical tool of choice.

RESULTS

One hundred patients who were about to have surgery on their middle ear were chosen for the research, and they were split into two groups of fifty patients each using a random process. Patients in Group S, who were given sevoflurane, and patients in Group D, who were given desflurane intraoperatively for the purpose of maintaining anaesthesia, respectively.

Table 1: Comparison of age distribution of groups S & D

Age in years	Group S		Group D	
	No.	%	No.	%
12-20	3	6	3	6
21-30	8	16	12	24
31-40	11	22	16	32
41-50	18	36	13	26
51-60	10	20	6	12
Total	50	100	50	100
Mean ±SD	39.98±5.69		38.02±7.22	
'p' Value- 0.11				

The difference in age group of the study participants are comparable and statistically insignificant.

Table 2: Comparison of Systolic BP of between Group S & Group D

Systolic BP	Group S	Group D	'p' value
Pre-op	119.43±10.13	119.50±8.84	0.63
Intubation	122.16±10.91	121.53±8.22	0.51
5mins	121.13±8.16	121.96±10.95	0.41
10mins	121.4±7.79	120.3±9.54	0.44
15mins	119.4±7.80	115.93±9.25±	0.22
30mins	117.5±8.51	120.90±10.85	0.37
60mins	119.30±8.98	121.23±9.75	0.51
90mins	115.54±6.17	121.5±9.60	0.07
End of surgery	123.70±10.04	119.46±11.17	0.21

Table 3: Comparison of Diastolic BP of between Group S & Group D

Diastolic BP	Group S	Group D	'p' value
Pre-op	74.93±5.79	78.13±5.14	0.07
Intubation	77.26±6.28	78.03±6.23	0.21
5mins	78.83±5.64	80.06±6.38	0.22
10mins	80.16±5.57	78.13±6.68	0.32
15mins	78.70±5.79	78.26±5.25	0.44
30mins	78.40±6.35	77.16±4.93	0.37
60mins	78.23±5.60	77.63±6.29	0.51
90mins	78.32±6.31	79.6±6.14	0.28
End of surgery	78.13±6.08	75.26±6.45	0.21

Table 4: Comparison of Heart rates between Group S & Group D

Heart rate (mins)	Group S	Group D	'p' value
Pre-op	85.9±12.39	89.76±12.55	0.33
Intubation	82.80±13.50	88.40±13.31	0.24
5mins	87.83±11.13	88.40±10.70	0.54
10mins	84.96±10.78	82.30±10.42	0.44
15mins	86.23±9.27	82.90±10.04	0.29
30mins	87.23±10.04	85.80±9.01	0.25
60mins	89.26±9.70	84.96±10.58	0.14
90mins	90.43±10.06	83.90±8.84	0.36
End of surgery	89.30±12.94	86.16±9.10	0.21

The difference in intraoperative hemodynamics in terms of Systolic Blood Pressure , Diastolic Blood Pressure and Heart rate were comparable between the two groups and statistically no significance 'p' value >0.05 from preoperative period to end of surgery.

Table 5: Duration of anesthesia and surgery

	Group S	Group D	'p' value
Duration of Surgery (mins)	83.8±9.41	86.36±7.63	0.41
Duration of Anesthesia (mins)	106.14±7.41	105.36±6.36	0.26

The differences in the duration of surgery and anaesthesia between groups S and D were comparable and statistically insignificant, with p values of 0.41 and 0.26 respectively. The mean duration of surgery and anaesthesia in groups S and D were respectively 83.8±9.41 minutes, 106.14±7.41 minutes, and 86.36±7.63 minutes, 105.36±6.36 minutes.

Table 6: Comparison of PONV in first 24 hrs. in groups S & D

Incidence of Post-operative nausea and vomiting			
Group S		Group D	
No. of patients	% of patients	No. of patients	% of patients
12	24%	14	28%

Since the value of the Fisher exact test statistic is 1, there was not a statistically significant difference between the two groups in terms of PONV, as shown by the p value being greater than 0.05.

DISCUSSION

Having an operating field that is bloodless and immobile, non-fluctuant hemodynamics, no rise in middle ear pressures, and a decreased incidence of postoperative morbidities, particularly nausea and vomiting, are all requirements for middle ear procedures (PONV). During middle ear surgery, postoperative nausea and vomiting (PONV) is a frequent complication that may be reduced to a tolerable level with the right choice of anaesthetic method and antiemetic prophylaxis [3-5]. The majority of treatments involving the middle ear may be done as outpatient surgery; hence, a speedy recovery, effective analgesia, and the prevention of nausea and vomiting are crucial [6]. The hypotensive action of sevoflurane is brought about through direct vasodilation, and it does so without affecting the blood flow to the cochlea [9,10]. Surgery on the middle ear is linked with a substantial risk of postoperative nausea and vomiting (PONV). Surgery on the middle ear is linked with a substantial risk of postoperative nausea and vomiting (PONV). The aetiology of PONV is multifaceted and relies on a variety of variables, such as patient demographics, a previous history of PONV, anaesthetic technique, the use of nitrous oxide, the length of time spent under anaesthesia and undergoing surgery, and even previous surgical experience [11,12,13]. In this research, intraoperative and perioperative outcomes (PONV) involving middle ear procedures that were performed under the influence of sevoflurane and desflurane as anaesthetic agents were evaluated. While doing surgery on the middle ear, the optimum anaesthetic would be one that would maximise the visibility of the operating region without causing significant arterial hypotension. Sevoflurane and desflurane provided the answer to the question of which anaesthetic agent would be most suited to provide intraoperative anaesthesia and meet the objectives of middle ear procedures. This study was conducted to compare the effects of sevoflurane and desflurane on intra-operative hemodynamic and post-operative profile (ponv) in middle ear surgeries in terms of systolic blood pressure, diastolic blood pressure, heart rate, and ponv. The study was undertaken in order to compare the effects of sevoflurane and desflurane on intra-operative hemodynamic and post-operative profile (ponv). Participants were given a random assignment that assigned them to one of two groups: group S (sevoflurane) or group D. (desflurane). The two different anaesthetic groups were also comparable with regard to demographic variables such as gender, ASA grade, durations of anaesthesia and surgery, as well as doses of medications that were used for premedication, the amount of propofol used for induction, and the amount of intra op analgesic requirement. Inhalational anaesthetics containing sevoflurane were administered to Group S at a concentration of 1-2%, whereas Group D got 4-6%. For assessing intraoperative hemodynamic status - heart rate ,systolic and diastolic blood pressure were recorded before induction (pre op) and at time of intubation, at 5min , 10 min,15mins,30 min and every 30 min till end of surgery. All study patients were in age group of 12yrs to 60yrs ,the Mean age (Mean±SD) in Group S was 39.98±5.69 and Group D was 38.02±7.22, the difference between both study groups was statistically insignificant ‘p’ value 0.11 .The two anesthetic agents used in our study appeared to achieve objectives of maintaining intraoperative hemodynamic stability and providing optimal surgical conditions. The preoperative mean pulse rate in Group S and Group D are 85.9 ± 12.39 and 89.76± 12.55 the difference is comparable but statistically insignificant ‘p’ value 0.33, preoperative mean systolic blood pressure in Group S and in Group D - 119.43±10.13. 119.5±8.84 and differences observed are statistically insignificant ’p’ value 0.63, Diastolic blood pressure in Group S and Group D 74.93±5.79 and 78.23±5.14, differences observed are statistically insignificant ‘p’ value 0.07. Intraoperatively all study patients hemodynamics (HR, SBP & DBP) were recorded. Intraoperative mean heart rates of patients in Group S (82.8±13.50, 87.73±11.13 , 84.96±10.78, 86.23±9.27, 87.23±10.04, 89.26±9.70, 90.43±10.06) was compared with Group D (88.4±13.31, 88.4±10.70, 82.3±10.42, 82.9±10.04, 85.8±9.01, 84.96±10.58, 83.9±8.84) at all time intervals are found to be statistically insignificant p >0.05. SBP intraoperatively for Group S (Mean±SD) (122.16±10.91, 121.13±8.16, 121.4±7.79, 119.4±7.80, 117.5±8.51, 119.3±8.98 ,115.54±6.17) was compared with Group D (121.53±8.22, 121.96+10.95, 120.3±9.54, 115.93±9.25, 120.9±10.85, 121.23±9.75, 121.5±9.68), it was observed that the difference in intraoperative systolic

blood pressure were comparable and statistically insignificant at all time intervals p > 0.05. Intraoperatively DBP for Group S(Mean±SD) (77.26±6.28, 78.83±5.64, 80.16±5.57, 78.7±5.79, 78.4±6.35, 78.23±5.60, 78.32±6.31) was compared with Group D(78.13 ± 6.23,80.16±6.38, 78.23±6.68 ,78.36±5.25, 77.26±4.93,77.73±6.29, 79.7±5.24), the observation was diastolic blood pressure at all time intervals intraoperatively between study groups is comparable and statistically insignificant 'p' value > 0.05 . Mean heart rate postoperatively for Group S and Group D are (89.3±12.94) and (86.16±9.10) difference was statistically insignificant 'p'value >0.05 , postoperative SBP and DBP in Group S -123.7±10.04 and 78.13±6.08 and Group D is 119.46±11.17and 75.36±6.45were comparable and statistically insignificant p value 0.21 and 0.21 respectively. The intra-operative hemodynamic profile of desflurane and sevoflurane for anaesthetic maintenance in day care laparoscopic gynaecological procedures was evaluated and compared by Mayur Patel and colleagues [14]. The intraoperative hemodynamic parameters are similar in both desflurane and sevoflurane anaesthesia, which is in concordance with our study. A prospective randomised single-blind study was conducted in 100 female patients belonging to ASA grade I or II patients. The patients were randomised into two groups to receive either desflurane (group D; n = 50) or sevoflurane (group S; n = 50) for maintenance of anaesthesia. Balta AZ et al[15]. examined the mean arterial pressure (MAP), intracranial pressure (ICP), and cerebral perfusion pressure (CPP) in normocapnic patients who were having craniotomy for supratentorial brain tumours with 1 MAC of either isoflurane or desflurane (with 60% N2O). The measurements of ICP taken throughout the trial did not alter when compared with the values taken at the beginning of the study for either group, and the researchers could not identify any statistically significant differences between the two groups in terms of MAP, ICP, or CPP. The results of our investigation showed that both groups had comparable hemodynamic parameters, which was consistent with the findings of the study that came before this one; however, we did not evaluate ICP in this study. Sponheim et al. [16] reported a dose-dependent and clinically similar increase in intracranial pressure (ICP) and reduced mean arterial pressure (MAP) with P 0.001 and CPP at 0.5 and 1.0 MAC of isoflurane, sevoflurane, and desflurane in N 2 O (60%) in hypercapnic children of study population of 36 divided into 3 groups of 12 each. The results were statistically significant. They came to the conclusion that a dose-dependent rise in ICP occurred with 0.5 and 1.0 MAC of isoflurane, sevoflurane, and desflurane in N 2 O. Moreover, there was a dose-related decrease in MAP and CPP. Our research found that the SBP and DBP values (which indicate MAP) were statistically insignificant, which is consistent with the findings of this other study; however, we did not examine their effects on ICP. Sevoflurane and desflurane were compared in terms of their hemodynamics, emergence, and recovery features under nitrous oxide anaesthesia by White et al. [17]. The researchers came to the conclusion that the two groups were comparable in terms of these hemodynamic parameters. The findings from our research are in line with those found in [15]'s research. The results shown here are in agreement with those of a comparative research carried out by Heavner et al. [18], which demonstrated that sevoflurane and desflurane offered comparable intraoperative conditions throughout the maintenance phase. According to the findings of the research conducted by Nathanson[19], sevoflurane and desflurane seemed to provide comparable intraoperative conditions throughout the maintenance phase. Even while desflurane promoted a quicker early recovery, there was no discernible difference in the end points of the middle phase of recovery. S Gergin, B Cervik, and G B yildrium[20] came to the conclusion that intraoperative cardiovascular stability could be easily achieved with both sevoflurane and desflurane. During maintenance, MAP and HR were maintained at +/- 20% of their respective baseline values, and while HR decreased below baseline values, blood pressure fell less in the desflurane group. Desflurane, much like sevoflurane, helps to keep the patient's hemodynamics stable while they are undergoing intraoperative procedures. Despite the fact that the duration of anaesthesia was greater in the desflurane group, the early recovery profile was quick. In our research, a decrease in heart rate caused by desflurane was not very noticeable, and the heart rates of those in group S and group D were not significantly different from one another. The SBP and DBP readings, which indicate MAP, together with HR exhibited no statistically significant differences. All of the patients were monitored postoperatively for PONV during the first twenty-four hours, and a statistical analysis revealed that there was no discernible difference between the two groups (p > 0.05). given that the result of the Fisher exact test statistic is 1, The researchers Gupta et al.[21] undertook a comprehensive examination of recovery following ambulatory surgery, comparing isoflurane, sevoflurane, and desflurane. They came to the conclusion that early recovery and time to obey was much shorter with desflurane when compared to sevoflurane and isoflurane. They also found that the amount of time it took for the patient to be ready to return home after receiving sevoflurane was five minutes less than it was after receiving isoflurane, and that other metrics, such as pain, nausea, and vomiting, were equivalent. Similar findings emerged from our investigation, with the notable exception that we did not analyse recovery parameters. It was shown in the research by Kim et al[22] that late recovery profiles

and incidences of postoperative side effects were comparable after desflurane and sevoflurane. The study also indicated that the incidence of postoperative nausea and vomiting was equal in both groups. The findings of our investigation are consistent with the findings of this study.

CONCLUSION

Both sevoflurane and desflurane, when used as maintenance agents in middle ear procedures, did an equally good job of maintaining a stable intraoperative hemodynamics, and there was no significant difference in the incidence of post-operative nausea and vomiting between the two.

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