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Comparison between Sevoflurane and Isoflurane Effects on Hemodynamic Status

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Abstract

Back ground: Volatile anaesthetics are known to cause hypotension because of its effects on the central nervous system and autonomic nervous system, on the myocardium as well as its direct action on vascular smooth muscle.
Aim of study: is to compare between sevoflurane and isoflurane effects on pulse rate and mean blood pressure during general anaesthesia.
Patients and methods: this prospective study was carried out at Al-Hilla Teaching Hospital/Babylon as well as Balad General Hospital/Salah Al-Din, from 2nd (March) 2021-20th (May) 2021. Thirty patients between the ages 7- 68 years were enrolled in this study, 13 Male and 17 females. All patients fasted for 8-10 hours before proposed time of surgery. In all selected patients, pulse rate and mean blood pressure was recorded at baseline, at intubation at (5 Minute), (10 Minute), (15 Minute), (20 Minute), (25 Minute), (30Minute), (40 Minute) of the time of operation, extubation, and recovery.
Results: showed that non-significant differences between inhalation agent (sevoflurane and isoflurane) and hemodynamic status (pulse rate and Mean blood pressure) at different time. The Groups according to their gender, showed high percentage of 38.5% in males at age group of 36-50. While 50.0% of females at age group 21-35 years. The most patients which received Isoflurane as inhalational agent were female groups (52.9%) versus (46.2%) for male groups, the female group which received Sevoflurane inhalational agent were (47.1%) versus (53.8%) for male groups.
Conclusion: it conclude that the sevoflurane and isoflurane is more anesthetic stable gas on heart rate and mean blood pressure.

Keywords: Isoflurane; Sevoflurane; Hemodynamic Status; Inhalation Agent.

1. Introduction

Inhalational anesthetics agents have been used for surgical anesthesia and analgesia. Sevoflurane and desflurane are the most recent contributors of halogenated inhalational agents. By inhalation of anesthetics agents, they reach the alveoli and quickly pass through the alveolar membrane, then, the bloodstream transfers the agents to all perfused organs [1,2]. Mean alveolar concentration (MAC) has been utilized as routine criteria to determine the efficiency of inhalational anesthetics agents. In definition, MAC is a concentration of an inhalational anesthetics agent that prevents muscular movements in reaction to the surgical stimulation in 50% of individuals; Values of (MAC) change for various agents and are dependent to the patients' ages [3,4]. In the anesthesia induction the most important, both intravenous anesthetics and inhalational could effect on performance of cardiovascular; included effects on output of cardiac, rate of heart, or pressures of blood [5]. Intravenous or inhalational anesthetics choice is usually linked with patient's adherent status of cardiovascular, like the hypovolemia and presence failure of heart [6]. Pulse rate: number the beats of heart per minute and the method used to measure is pulse oximetry, are adout of numerical provides of the saturation oxygen of patient, a readout numerical rate of pulse [7]. Monitors of automatic blood pressure tell you diastolic and systolic reading of blood pressure [8]. Plenty of them include a little number in drew below or beside your standard reading pressure of blood ,this number in drew is the (mean arterial pressure) (MAP) also you can think of (MAP) is the pressure average in your arteries during one of cardiac cycle, included the sequence of events that engenders all the time your beats of heart [9]. Elevated (MAP) is meaning (above 100 mmHg), this indicated that a high pressure in the arteries. Much reason that lead to so high pressure of blood can lead to increase in (MAP). Anything (below 60 mmHg) considered usually decreased in (MAP). [10-12].

2. Patients and Methods

This study conducted in Al-Hilla Hospital Teaching/Babylon, Balad General Hospital/Salah Al-Din, during the period from 2 March 2021 to 20 May 2021. Under the supervision of the Department of Anesthesia Techniques at the College of Health and Medical Technology - Baghdad. Thirty patients between 7 - 68 years old were enrolled in this study. Male was 13 and female was 17. The protocol of anesthetic in this study consisted standard of a premedication, drugs of pre-anesthetics are main important under circumstances clinically. Anesthesia induction achieved mainly by anesthetics intravenous because of the onset is very fast of action and administration easily. All patients fast for 8-10 hours before proposed time of surgery. In all selected patients, pulse rate, mean blood pressure was recorded at baseline, at intubation at (5 Minute), (10 Minute), (15 Minute), (20 Minute), (25 Minute), (30 Minute), (40 Minute) of the time of operation, extubation, and recovery. All patients as premedication given tramadol (1.5 mg\kg), dexamethasone (0.1 mg\kg), metoclopramide (0.1 mg\kg), ranitidine (0.9 mg\kg), and with all patients used propofol, ketamine (0.5 mg\kg) (1.5mg\kg), atracurium as a muscle relaxant (0.5 mg\kg), and inhalational agent either isoflurane (1.2%) or sevoflurane (1.8%).

3. Results

In table 1 show distribution of age groups according to gender, highly percentage (38.5%) in male at age group (36-50) years, while (50.0%) in female at age group (21-35) years, there are non-significant associated between age group and gender (P-value=0.1).

Table 1 Distribution of age groups (Years) according to gender

Categorial age group/years		Gender		Total
		Male	Female	
(7-20) yrs	Count	3	0	3
	% within Gender	23.1%	0.0%	10.3%
(21-35) yrs	Count	3	8	11
	% within Gender	23.1%	50.0%	37.9%
(36-50) yrs	Count	5	5	10
	% within Gender	38.5%	31.3%	34.5%
(51-65) yrs	Count	2	1	3
	% within Gender	15.4%	6.3%	10.3%
(>65) yrs	Count	0	2	2
	% within Gender	0.0%	12.5%	6.9%
Total	Count	13	16	29
	% within Gender	100.0%	100.0%	100.0%

P-value=0.1 (non-significant)

Table 2 observed that the most patients which received Isoflurane as inhalational agent were female groups (52.9%) versus (46.2%) for male groups, also this table revealed that the female group which received Sevoflurane inhalational agent were (47.1%) versus (53.8%) for male groups, statistically this differences was non-significant with (P-value= 0.7).

Table 2 Distribution of (inhalational agent) according to gender

Inhalational agent		Gender		Total
		Male	Female	
Isoflurane	Count	6	9	15
	% Within Gender	46.2%	52.9%	50.0%
Sevoflurane	Count	7	8	15
	% Within Gender	53.8%	47.1%	50.0%
Total	Count	13	17	30
	% Within Gender	100.0%	100.0%	100.0%

P-value=0.7 (non-significant)

Table 3 show comparison between sevoflurane and isoflurane in different time (PR-Before, PR -Intubation, PR- at 5, 10, 15, 20, 25, 30, 40-minute, PR extubation and PR in recovery). There are little differences between the reading of the pulse rate at different time of induction under the effect of both Isoflurane and Sevoflurane, while statistically these differences were non-significant under the effect of (2) type of inhalation agent.

Table 3 Comparisons the levels of Pulse rate under different period of induction under 2 type of inhalation agent

Time of induction	Inhalational agent	N	Mean	Std. Deviation	t-test	*P-value
PR-Before	Isoflurane	15	95.26	15.24	1.5	0.14 (N.S)
	Sevoflurane	15	104.80	19.27		
PR -Intubation	Isoflurane	15	97.60	18.77	2.0	0.5 (N.S)
	Sevoflurane	15	112.13	20.20		
PR- at 5 min	Isoflurane	15	92.33	16.32	1.5	0.12 (N.S)
	Sevoflurane	15	101.66	16.12		
PR- at10 min	Isoflurane	15	89.53	18.25	1.08	0.28 (N.S)
	Sevoflurane	15	96.46	16.77		
PR- at15 min	Isoflurane	15	91.60	13.94	0.1	0.9 (N.S)
	Sevoflurane	15	91.66	15.57		
PR- at20 min	Isoflurane	15	88.40	14.700	0.9	0.36 (N.S)
	Sevoflurane	15	93.93	18.10		
PR- at25 min	Isoflurane	15	80.73	9.66	1.94	0.06 (N.S)
	Sevoflurane	15	91.93	20.09		
PR- at30 min	Isoflurane	15	83.93	11.15	0.57	0.5 (N.S)
	Sevoflurane	15	87.20	18.83		
PR- at40 min	Isoflurane	15	86.46	14.77	0.42	0.67 (N.S)
	Sevoflurane	15	88.80	15.39		
PR extubation	Isoflurane	15	112.26	19.45	0.09	0.97 (N.S)
	Sevoflurane	15	111.66	15.85		
PR recovery	Isoflurane	15	102.20	23.65	0.44	0.65 (N.S)
	Sevoflurane	15	98.60	20.34		

*; Independent Sample-Test; N.S, non-significant

Table 4 show comparison between sevoflurane and isoflurane in different time (mean blood pressure (MBP)-Before, MBP-Intubation, MBP – at 5, 10, 15, 20, 25, 30, 40 minutes, MBP- extubation and MBP in recovery). There are little differences between the reading of the MBP at different time of induction under the effect of both Isoflurane and Sevoflurane, statistically these differences were mostly non-significant under the effect of (2) type of inhalation agent.

Table 4 Comparisons the levels of mean blood pressure under different period of induction under effect of (2) type of inhalation agent

Time of induction	Inhalational agent	N	Mean	Std. Deviation	T-test	P-value
MBP-Before	Isoflurane	15	96.80	13.72	2.05	0.04
	Sevoflurane	15	107.00	13.43		
MBP- Intubation	Isoflurane	15	101.93	24.54	1.0	0.9
	Sevoflurane	15	102.73	19.13		
MBP- at5 min	Isoflurane	15	103.33	22.34	1.67	0.19
	Sevoflurane	15	91.46	15.89		
MBP- at10 min	Isoflurane	15	99.73	21.04	1.68	0.11
	Sevoflurane	15	89.00	14.72		
MBP- at15 min	Isoflurane	15	98.73	23.69	1.1	0.27
	Sevoflurane	15	90.66	15.37		
MBP- at20 min	Isoflurane	15	98.46	20.43	1.38	0.17
	Sevoflurane	15	89.86	12.59		
MBP- at25 min	Isoflurane	15	93.40	15.31	0.59	0.5
	Sevoflurane	15	96.33	11.33		
MBP- at30 min	Isoflurane	15	94.46	14.67	0.1	0.9

MBP- at40 min	Sevoflurane	15	93.93	13.60	0.7	0.4
	Isoflurane	15	92.00	12.08		
MBP- extubation	Sevoflurane	15	96.06	15.91	0.9	0.3
	Isoflurane	15	112.46	18.21		
MBP- recovery	Sevoflurane	15	107.33	11.38	1.88	0.07
	Isoflurane	15	107.73	19.05		
	Sevoflurane	15	95.93	14.99		

*; Independent Sample-Test; N.S, non-significant

4. Discussion

Volatile anaesthetics are known to cause hypotension because of their effects on the central nervous system and autonomic nervous system, on the myocardium and because of the direct action on vascular smooth muscle. [13,14]. Inhalational anesthetics agents have been used for surgical anesthesia and analgesia, the anesthetics volatile drugs (e.g., halothane, sevoflurane, isoflurane and desflurane) cause dependent dose and effect on functions of cardiovascular especially pulse rate and mean blood pressure. This study shows the effects of the sevoflurane and the isoflurane on the pulse-rate and mean blood pressure in different intervals, so compared with PR and MBP at baseline of each gas; there was significant difference in pulse rate and mean blood pressure at intubation, no significant different at (5 Minute), (10 Minute), (15 Minute), (20Minute), (25 Minute), (30 Minute), (40 Minute), extubation and recovery. Recent studies found there was significant difference in pulse rate and mean blood pressure at intubation when using both sevoflurane and isoflurane. It might be attributed to autonomic nervous stimulation during forced applied of laryngoscope or intubation which sometimes lead to changes in hemodynamic parameters [15,16]. Similar to other contemporaneous anesthetics, sevoflurane causative directory of depression of myocardial. Instability of hemodynamic noted in some subjects at high concentrations of anesthetic in the absence of surgical stimulation, as a result cardiovascular effects of sevoflurane were similitude to those of isoflurane, this agreement with (Malan, P. *et al,* 1995) [17]. Although there is increase in rate of pulse and mean blood pressure of human when undergo to general anesthesia at intubation when use isoflurane or sevoflurane, but using of Sevoflurane provide evenly movingly control of homeostasis of cardiovascular and safe as isoflurane, with a most fast discharging from the area of recovery, this agreement with (TorriD, G., 2000) [18].Vasodilatation may be causes the direct relaxant actions on vascular smooth muscle [19,20], decrease in sympathetic output or low in the effectiveness of other stimuli on the vascular smooth muscle. The precise mechanisms cannot be identified in the complex clinical situation [21].

5. Conclusion

Based on the findings of this study, we can have concluded that Sevoflurane and isoflurane is more anesthetic stable gase on heart rate and mean blood pressure, so that is reliable with patient who have heart problems.

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