ORIGINAL ARTICLE

COMPARISON OF HAEMODYNAMIC CHANGES WITH PROPOFOL AND SEVOFLURANE ANAESTHESIA DURING LAPAROSCOPIC SURGERY

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ABSTRACT

Sevoflurane is a useful alternative to propofol in providing anesthesia where rapid emergence and recovery of cognitive function are desired. In this randomized study, hemodynamic changes and recovery characteristics of sevoflurane anesthesia were compared with propofol anesthesia in fifty patients of America Society of Anesthesiology (ASA) Grade I and II undergoing laparoscopic surgeries of 1-2 hr duration. Injection fentanyl was used as an adjuvant to provide analgesia. In Group-I patients, anesthesia was induced with propofol-2 mg/kg i.v. and maintained with sevoflurane-N_2O-O_2 and injection vecuronium. The inspired concentration of sevoflurane was kept between 1 to 1.5%. In Group-II patients, anesthesia was induced with propofol-2 mg/kg i.v. and maintained with propofol infusion-N_2O-O_2 and injection vecuronium. Propofol infusion was given in a range of 75 to 125microgram/kg/min.
Induction with propofol was without any untoward hemodynamic changes or episodes of coughing or laryngospasm. Mean heart rate during maintenance was much lower as compared to baseline in group-II than in group-I. There was no episode of sever bradycardia which needed treatment in any of the groups. The incidence of tachycardia could be controlled with increase in inspired concentration of volatile anesthetic agent. Fall in mean blood pressure was more in group-II than in group-I. No undesired event was noted intraoperatively in any group. There was no significant difference in the incidence of Post Operative Nausea and vomiting (PONV) in two groups. The use of sevoflurane resulted in greater hemodynamic stability while propofol caused reduction in heart rate and blood pressure. Also the use of sevoflurane resulted in faster emergence from anesthesia as compare to propofol.

KEY WORDS: Propofol, Sevoflurane, Laparoscopy

INTRODUCTION

Now a days laparoscopy is widely used for various surgeries like Appendicectomy, cholecystectomy, hernia etc. It has also been started on day care basis, where we need patient to be completely awake and fast recovery after general anaesthesia.

Propofol (2,6di-isopropylphenol) is one of the most frequently used intravenous anaesthetic. It has high lipid solubility. The kinetics of propofol allows rapid induction of anesthesia, adequate maintenance, rapid return of consciousness and minimum postop sickness (Nausea, vomiting, respiratory depression).[1, 2, 3]

Sevoflurane is fluorinated methyl isopropyl ether, a newer halogenated volatile anesthetic, has lower blood gas solubility, pleasant to inhale, offers good hemodynamic stability, and provides rapid emergence.[4,5,6]

We selected 50 patients of ASA GRADE-I and GRADE-II and randomly grouped them, in group-I patients, sevoflurane–N_2O was used for maintenance and in group-II patients propofol-N_2O. Hemodynamic changes and recovery characteristics after general anesthesia with sevoflurane-N_2O (group-I) and Propofol-N_2O(group-II) were compared.

MATERIALS AND METHOD

Fifty patients of ASA physical status I or II aged between 18-60 years of either sex scheduled for various elective surgeries of less than 2 hr duration under general anesthesia were included in the study. Patients with clinically significant cardiovascular, pulmonary,

renal or hepatic disease or h/o hypersensitivity to halogenated anesthetic agents were excluded. It was an open and none blind study design. Patients were randomly assigned to one of the two groups. In Group-I anesthesia was induced with propofol and maintained with sevoflurane-N_2O-$O_2$and in Group II anesthesia was induced with propofol and maintained with propofol-N_2O-O_2.

Preanesthetic checkup was done on the day before and on the morning of surgery. Clinical examination was done and routine investigations like hemoglobin, renal function tests, serum electrolytes, random blood sugar, and chest X-ray PA view were advised.

On the table reports noted, monitors were attached and vital parameters like pulse, blood pressure, SpO_2, ECG etc were noted. Premedication in the form of glycopyrrolate 4 microgram\kg i.v. was given after placement of i.v.cannula. After administering fentanyl (1 microgram/kg i.v.) and lidocaine (1.5 microgram/kg i.v.), preoxygenate with 100% O_2 for 5 min, anesthesia was induced with propofol-2mg/kg. The occurrence of pain due to injection of intravenous propofol, excitatory phenomenon (e.g. moving, myoclonus), respiratory problem (e.g. coughing, apnea, laryngospasm, bronchospasm) and other adverse effect were watched for and recorded. In both groups, intubation of the trachea was facilitated with succinylcholine (2mg/kg i.v.).

In group-I, anesthesia was maintained with sevoflurane, nitrous oxide (50%) and oxygen (50%), and in group-II with propofol infusion, nitrous oxide (50%), and oxygen (50%). The inspired concentration of the volatile anesthetic was adjusted as per the need to maintain the blood pressure and heart rate within 15% of the preincision values. Vecuronium was administered for muscle relaxation. Controlled ventilation with 8L flow was done by using Bain's circuit. ECG, Noninvasive blood pressure, heart rate, SpO_2 and End Tidal CO_2 ($ETCO_2$) were monitored throughout. These vital parameters were recorded every minute from induction of anesthesia for 5 minutes and subsequently at 10-15 minute intervals. At the end of surgery, residual neuromuscular blockade was reversed with neostigmine (50microgram/kg i.v.) and glycopyrrolate (8microgram/kg i.v.). Volatile anesthetic and nitrous oxide were discontinued at the end of surgery. Time of discontinuing volatile anesthetic and propofol infusion was noted. The time at which the patient opened his/her eyes and responded to verbal commands were recorded. Extubation of trachea was done after adequate recovery from the effects of neuromuscular blockade. Extubation time and the time when patients were able to state their name was recorded. Anesthesia and operative time was also recorded. Follow up for post operative sickness like nausea, vomiting and general discomfort was done for 24 hrs. Data are expressed as mean values+/SD.

OBSERVATION AND RESULTS

50 patients belonging to ASA Grade I-II were divided in 2 groups. The patients in our study were belonged to age group 18-60 years. There was no significant difference in the mean age or weight and sex distribution among patients in two groups.

Table-1: Demography of Patients

Parameter	Group I	Group II
Mean Age (yrs)	35.32	36.08
Mean Weight (kgs)	52.88	51.36
No. of Male Patients	8	12
No. of Female Patients	17	13
Operating time (min)	76.2	74.3
Anesthesia time (min)	98.4	92

Table-2: Induction of Anesthesia Characteristics

Signs/Symptoms	No. of patients	
	Group-I	Group-II
Pain on injection	0	0
Cough	0	0
Apnoea (no. of patients)	92% (23)	88%(22)
Movement (no. of patients)	0	0
Other side effects	Nil	Nil

Induction of anesthesia in group-I and group-II was smooth with no excitatory phenomenon, respiratory problems or other side effects. 92% of patients in group-I and 88% of patients in group-II went into apnea after induction with propofol.

Table-3: Changes in Heart Rate from Baseline in Both Groups

Deviation	No. of patients					
	Group-I			Group- II		
	Induction	Intra Operative	Recovery	Induction	Intra Operative	Recovery
+21to+30	0	0	0	0	0	0
+11to+20	0	4	4	2	0	0
+1to+10	18	12	7	23	0	0
No change	5	0	4	0	1	0
-1to-10	2	7	6	0	18	9
-11to-20	0	1	3	0	6	14
-21to-30	0	1	1	0	0	2

During induction heart rate increased upto +10 in 18 (group-I) and 23 (group-II) patients. During intra operative period heart rate increased up to +10 in 12 patients (group-I) and non from group-II, decreased up to -10 in 7 (group-I), 18 (group-II) and -20 in 6 (group-II) patients. Thus there was marked decrease in heart rate in group-II. During recovery heart rate increased upto +10 in 7 patients (group-I) and non from group-II, and decreased up to -10 in 6 (group-I), 9 (group-II) and up to -20 in 14 (group-II) patients.

Table-4: Changes in BP from Baseline in Both Groups

Deviation	No. of Patients					
	Group-I			Group-II		
	Induction	Intra Operative	Recovery	Induction	Intra Operative	Recovery
+21to+30	0	0	1	0	0	0
+11to+20	2	3	5	1	0	0
+1to+10	14	7	10	20	1	1
Baseline	2	1	2	2	0	1
-1to-10	7	8	5	2	11	4
-11to-20	0	5	0	0	11	8
-21to-30	0	1	2	0	2	8
>-30	0	0	0	0	0	3

During induction BP increased upto +10 from baseline in 14 (group-I) and 20 (group-II) patients. During intra operative period BP decreased up to -20 in 13 (group-I) and 22 (group-II) patients. During recovery BP increased upto +10 in 10 patients while it increased in the range of +11 to +20 in 5 patients and decreased up to -10 in 5 patients in group-I while in group-II BP decreased up to -10 in 4, -20 in 8 and -30 in another 8 patients. Thus BP decreased more in group-II.

Table-5: Mean $ETCO_2$ (mmHg) at Various Intervals

Time	Group-I	Group-II
Baseline	28.04 ±3.49	30.56 ± 2.12
Post induction	28.52 ± 3.31	31.4 ±1.91
Intubation	29.84 ± 2.83	32.72 ±1.28
1 minute	31.36±2.58	32.88±2.08
3 minute	31.72±3.37	32.52±1.66
5 minute	32.08±2.41	32.2 ±2
10 minute	31.8± 3.04	32.8±1.7
30 minute	30.2 ±2.67	33.12± 1.26
End	29.52± 2.1	32.52±1.29
Awake	29.48± 2.18	32.56 ±1.4

There were no significant changes on $ETCO_2$ levels throughout the surgery in both the groups.

Table-6: Recovery Characteristics

Recovery characteristics	Mean Recovery Times (min ±SD)	
	Group-I	Group-II
open eyes	2.86±0.66	5.41±0.99
follows commands	3.18±0.72	5.89±0.99
Extubation	3.78±0.66	6.33±1.02
states name	4.38±0.64	6.97±0.93

Compared to propofol group (II), the emergence times from cessation of the administration of the anesthetic agent to spontaneous eye opening, response to commands, extubation and to correctly state name were significantly shorter in the sevoflurane group (I).

Table-7: Post-Operative Complications

Complications	No. of Patients	
	Group-I	Group-II
PONV (No. of Patients)	5	2
Hemodynamic changes	-	-

As seen above 20% of Group-I patient against only 8% of group-II patients had vomiting. No significant hemodynamic complications were noted postoperatively in either group.

DISCUSSION

Rapid emergence from anesthesia and post op recovery of cognitive function as well as hemodynamic stability is important requirements of modern anesthesia. Generally both propofol and sevoflurane meet these criteria. Sevoflurane is widely used in clinical anesthesia because of its relative lack of airway irritation and myocardial depressant effect. Sevoflurane has a low blood gas partition coefficient of 0.69, which contributes to more rapid induction of and emergence from anesthesia than with other volatile anesthetics in current clinical use.

This study was conducted with the objective to compare the hemodynamic changes during general anesthesia with (I) sevoflurane and nitrous oxide after induction with propofol and with (II) propofol and nitrous oxide after induction with propofol in patients undergoing laparoscopic surgeries. Fifty patients of ASA status I or II aged 18-60 yrs were studied as per the protocol mentioned before. As per table-I there was no significant difference in the mean age, weight and sex distribution in two groups. The duration of the surgeries was about 1-2 hrs as per table-1. Injection fentanyl was used as an adjuvant for analgesia. During

induction there was no incidence of cough, laryngospasm and bronchospasm in any patient of any group.

Fredman et al. compared sevoflurane with propofol for outpatient anesthesia and found that there was no significant difference in the incidence of coughing, airway irritation or laryngospasm during induction of anesthesia. The incidence of apnea in both the groups were higher, it is comparable with our results. There was no pain on injection of propofol in both the groups as injection lidocaine-1.5mg/kg i.v. was given to these patients. Lidocaine was administered as prophylaxis against pain associated with propofol administration. Mean blood pressure was better maintained during sevoflurane induction as compare with propofol and while the difference may be of limited significance for healthy patients, the relative hypotension associated with propofol may be disadvantageous to the elderly and in patients with coronary artery disease.

Bradycardia was noticed in both the groups post induction as pts were induced with propofol. During the course of surgery, heart rate decreased more in group-II than in group-I, as group-II was maintained with propofol infusion. While with sevoflurane heart rate remained more or less stable throughout the operation. Mean blood pressure in group-II were lower when compared to group-I throughout the surgery. The inspired concentration of volatile anesthetic was adjusted as necessary to maintain blood pressure and heart rate within 15% of the preincision values. No complications were noted intraoperatively in any group. There was no episode of significant bradycardia which needed treatment in any of the groups. The incidence of tachycardia could be controlled with rise in inspired concentration of volatile anesthetic agent. W. Scoll jellish et al(1992)[7] compared the effects of sevoflurane versus propofol in the induction and maintenance of anesthesia in adult patients. Both groups were hemodynamically stable throughout the study period, is comparable with our results. Anil Gupta et al (2004)[1] compared recovery profile after ambulatory anesthesia with propofol and sevoflurane, a system review. No difference was found in the time taken for eye opening after sevoflurane and propofol anesthesia but time needed for obeying commands was shorter in the sevoflurane group(1.6min) is comparable with our study reports. Incidence of postoperative nausea and vomiting was significantly higher with sevoflurane. There were no other significant differences between the anesthetics.

Hwan S. Joo et al (2000)[3] conducted a meta-analysis to compare sevoflurane versus propofol for anesthetic induction. They found that propofol group had low incidence of post operative nausea and vomiting. Comparison of target controlled propofol infusion and sevoflurane inhalational anesthesia in laparoscopic cholecystectomy. Propofol-Target Cotrolled Infusion (TCI) and sevoflurane inhalational anesthesia are all effective in inducing good anesthetic effect, maintaining hemodynamic stability and ensuring rapid recovery, but propofol-TCI causes lower incidence of PONV in operations such as laparoscopic cholecystectomy. But in our study we did not find any difference in the incidence of PONV between propofol and sevoflurane group. Thus in our study, potential differences between the groups might have been masked by the use of inj fentanyl. But as this was necessary to optimize the anesthetic condition, its use was standardized in both the groups. The use of sevoflurane resulted in greater hemodynamic stability while propofol caused reduction in heart rate and blood pressure. Also the use of sevoflurane resulted in faster emergence from anesthesia than after propofol.

CONCLUTION

To conclude, heart rate and blood pressure decreased more in propofol group but patients were hemodynamically stable throughout the surgery in both the groups. Emergence and recovery after maintenance with sevoflurane–N_2O (group-I) was significantly faster than after propofol-N_2O (group-II). Thus sevoflurane may be considered as a useful alternative to propofol in providing anesthesia where rapid emergence and recovery of cognitive function are desired. But large randomized trials are indicated to determine hemodynamic changes, emergence and recovery of cognitive function to support this study.

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