

ORIGINAL ARTICLE

ASSESSMENT OF COST-EFFECTIVENESS AND RECOVERY PROFILE BETWEEN PROPOFOL AND SEVOFLURANE IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY: A COMPARATIVE STUDY

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ABSTRACT:

Background: Regaining of the consciousness as soon as possible along with negligible post-surgical sickness is one of the primary goals of anesthesia administration in short to moderate duration surgeries. In shorter surgeries, propofol has achieved the place of preferred intravenous anaesthetic agent because of its certain kinetic properties which need quicker and complication free recoveries. Another anaesthetic agent with relatively low blood-gas partition coefficient causes faster induction and the emergence with stable hemodynamic is Sevoflurane. Hence, we comparatively evaluated the cost-effectiveness and recovery profile between propofol and sevoflurane in patients undergoing laparoscopic cholecystectomy. **Materials & Methods:** A total of 180 patients who underwent laparoscopic cholecystectomy from June 2013 to July 2015 were included for the present study. All the patients were randomly divided into three study groups; Group A included patients who received propofol for both maintaining and inducing anaesthesia, Group B included patients who received propofol and sevoflurane for inducing an maintaining general anaesthesia respectively and Group C included patients who received sevoflurane for both maintaining and inducing general anaesthesia. Calculation of the cost of medicines, time duration of anaesthesia and time duration till returning of verbal and hemodynamic responses were noted and evaluated. All the results were analyzed by SPSS software. **Results:** Mean age of the patients in group A, B and C were 45.4 years, 41.52 years and 43.85 years respectively. Mean weight of the patients in the different groups was 54.2 kg, 54.7 kg and 56.45 kg respectively. Mean heart rate of the patients at the baseline was highest in the group A patients while in group B patients, it was lowest. Although alteration was seen in between all the study groups, no statistically significant correlation was obtained while comparing the baseline intra-operative parameters in between the various groups. Statistically significant results were obtained while comparing almost all the parameters in between the different groups. Non significant correlation was observed while comparing the side-effects in patients within different groups. **Conclusion:** In terms of cost-effectiveness, sevoflurane appears to be a better anaesthetic agent.

Key Words: Anaesthesia, Propofol, Sevoflurane

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INTRODUCTION

Faster regaining of the consciousness along with negligible post-surgical sickness is one of the primary goals of anesthesia administration in short to moderate duration surgeries. In shorter surgeries, propofol has achieved the place of preferred intravenous anaesthetic agent because of its certain kinetic properties which need quicker and complication free recoveries. Another anaesthetic agent with relatively

low blood-gas partition coefficient causes faster induction and the emergence with stable hemodynamic is Sevoflurane. For paediatric patients, it has become inhalational agent of choice because of its pleasant inhalation properties. Since, the newer coming inhalation agents have comparable recovering properties to those of propofol, studies and researchers are needed which compares the frequency of adverse effects and cost effectiveness of the propofol with other agents.¹⁻³ Hence,

we comparatively evaluated the cost-effectiveness and recovery profile between propofol and sevoflurane in patients undergoing laparoscopic cholecystectomy.

MATERIALS AND METHODS

The present study was carried out in the department of general surgery of the medical institution and included 180 patients who underwent laparoscopic cholecystectomy from June 2013 to July 2015. Age of the patients was between 17 years and 66 years and belonged to American Society of Anaesthesiologists (ASA) grade I or II. Ethical approval was obtained from the institutional ethical committee in written after explaining them the entire study protocol in written. Patients with any systemic illness, any known drug allergy or who underwent any major surgical procedures in the past 4 years were excluded from the present study. All the patients were randomly divided into three study groups; Group A included patients who received propofol for both maintaining and inducing anaesthesia, Group B included patients who received propofol and sevoflurane for inducing an maintaining general anaesthesia respectively and Group C included patients who received sevoflurane for both maintaining and inducing general anaesthesia. Before the starting of the surgery, pre-operatively alprazolam, ranitidine and metoclopramide were administered via oral route. Nitrous oxide: oxygen combination in equal proportion was used to maintain general anaesthesia along with continuous propofol or sevoflurane inhalation according to the study group for maintaining the bispectral index level in between 50 and 60 during the operation procedure. Calculation of the cost of medicines, time duration of anaesthesia and time duration till returning of verbal and hemodynamic responses were noted and evaluated. All the results were analyzed by SPSS software. Chi-square test and student t test were used for analyzing the level of significance.

RESULTS

Graph 1 shows the demographic and intraoperative details of the patients in various groups. Mean age of the patients in group A, B and C were 45.4 years, 41.52 years and 43.85 years respectively. Mean weight of the patients in the different groups was 54.2 kg, 54.7 kg and 56.45 kg respectively. Mean heart rate of the patients at the baseline was highest in the group A patients while in group B patients, it was lowest. Mean duration of anaesthesia was highest for group C patients (66.52 minutes). **Table 1** shows the p-value for comparison of various demographic and intra-operative parameters. Although alteration was seen in between all the study groups, no statistically significant correlation was obtained while comparing the baseline intra-operative parameters in between the various groups. **Graph 2** shows the mean cost effectiveness and expenditure of different groups. Mean cost of dumping the waste was 603.82, 502.18 and 410.72 in Group A, B and C respectively. Mean cost of disposing the disposable items was 120.75 and 10.79 for group A and B respectively. **Table 2** shows the p-value for comparison cost effectiveness and expenditure of different groups. Statistically significant results were obtained while comparing almost all the parameters in between the different groups. **Graph 3** highlights the post-operative variables and frequency of adverse effect in different groups. Group A patients had maximum mean time of extubation (9.81) in comparison to other groups. Nausea/vomiting was noticed in 14 percent cases of group B and C patients while in Group A patients, 12 percent cases showed these side effects. **Table 3** shows the p-value for the comparison of post-operative variables and frequency of adverse effect in different groups. Non significant correlation was observed while comparing the side-effects in patients within different groups.

Graph 1: Demographic details and intra-operative details of the patients

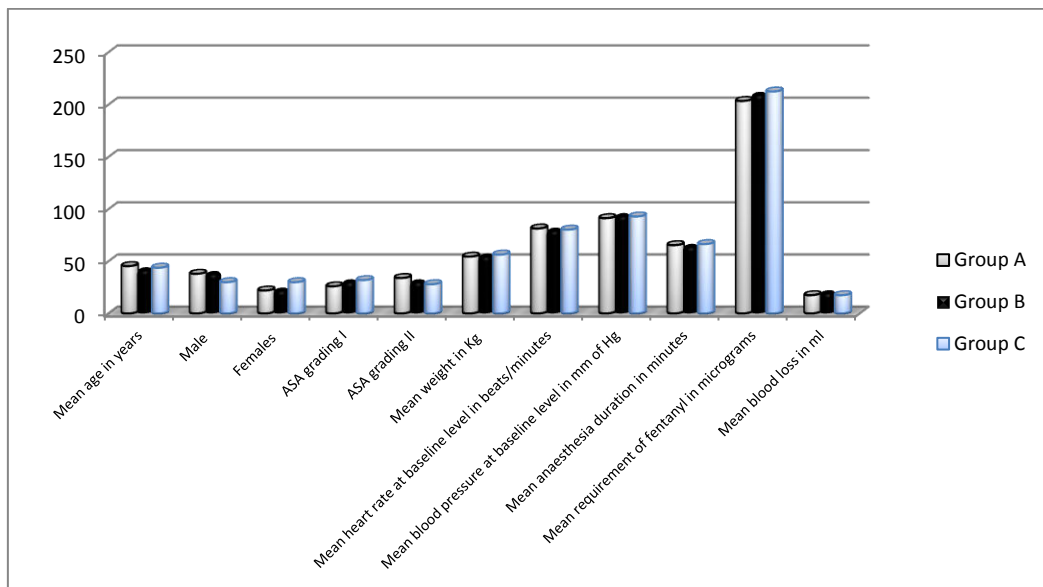


Table 1: P-value for the comparison of various demographic and intraoperative parameters between different groups.

Variable	Group A vs. Group B	Group A vs. Group C	Group B vs. Group C
Mean age in years	0.001*	0.650	0.252
Gender	1.002	0.542	0.562
ASA grading I/II	0.523	0.412	0.856
Mean weight in Kg	0.845	0.512	0.412
Mean heart rate at baseline level in beats/minutes	0.415	0.883	0.485
Mean blood pressure at baseline level in mm of Hg	1.005	0.875	0.974
Mean anaesthesia duration in minutes	0.253	0.415	0.395
Mean requirement of fentanyl in micrograms	0.753	0.718	0.416
Mean blood loss in ml	0.812	0.912	0.715

ASA: American society of anaesthesiologists, *: Significant

Graph 2: Mean cost analysis of patients in various groups

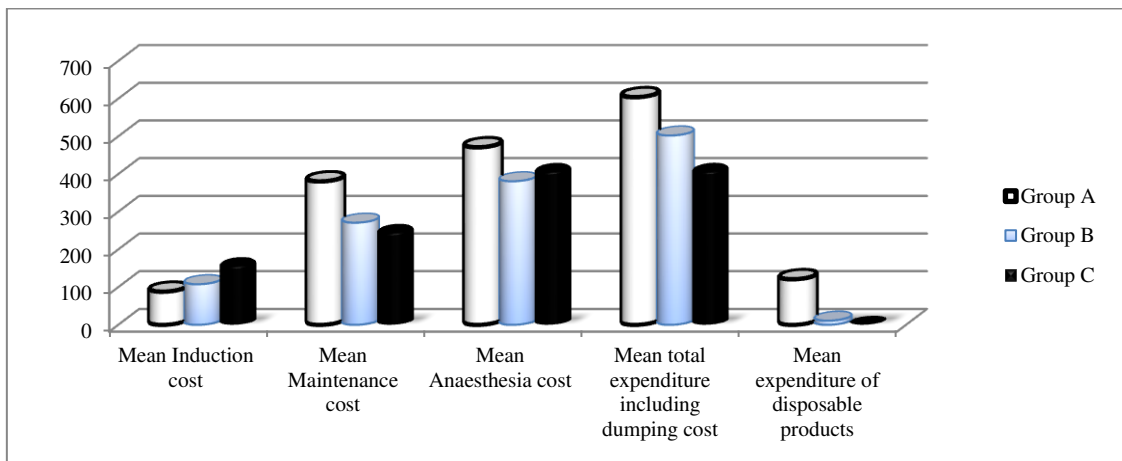


Table 2: P-value for the comparison of cost factors between different groups.

Variable	Group A vs. Group B	Group A vs. Group C	Group B vs. Group C
Mean Induction cost	0.002*	0.001*	0.005*
Mean Maintenance cost	0.004*	0.002*	0.50
Mean Anaesthesia cost	0.002*	0.004*	0.059
Mean total expenditure including dumping cost	0.002*	0.001*	0.003*
Mean expenditure of disposable products	0.005*	0.003*	0.004*

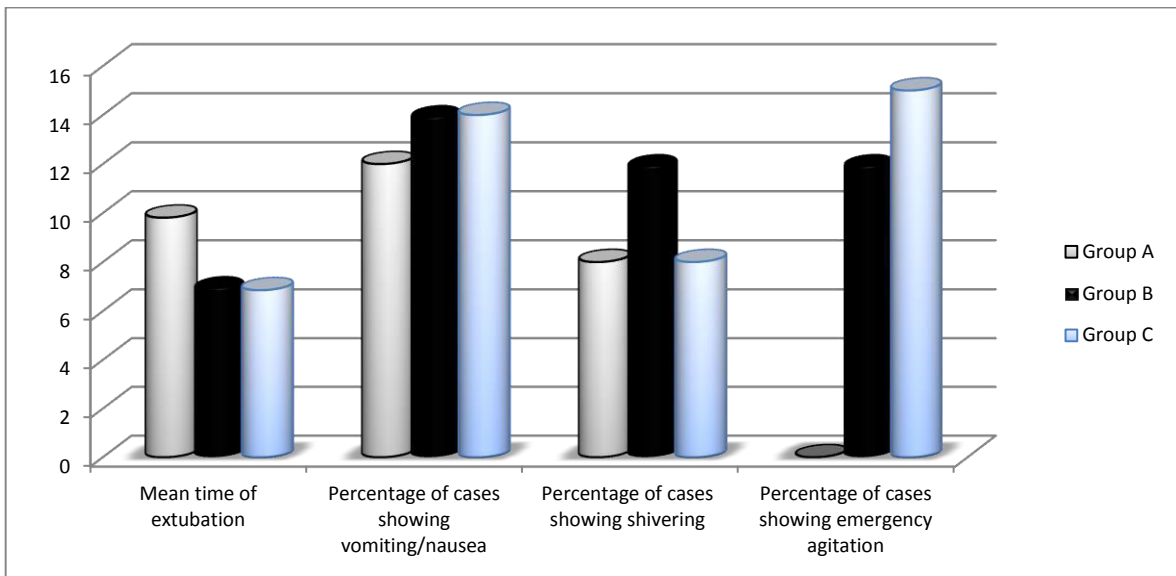
*: Significant

Table 3: P-value for the comparison of post-operative variables and frequency of adverse effect in different groups.

Variable	Group A vs. Group B	Group A vs. Group C	Group B vs. Group C
Mean time of extubation	0.001*	0.002*	0.090
Percentage of cases showing vomiting/nausea	0.075	0.085	0.952
Percentage of cases showing shivering	0.950	0.073	0.059
Percentage of cases showing emergency agitation	0.822	0.080	0.091

*: Significant

Graph 3: Post-operative variables and frequency of adverse effect in different groups.



DISCUSSION

Selection of anaesthetic agent for various major and minor surgical procedures depends on the clinical efficacy, pharmacokinetic profile, and economic feasibility of the anaesthetic agent.^{4, 5} In actual clinical practice, anesthesiologist prefers those anesthetic agents with which they are familiar with or tailor an anaesthetic technique considering its safety/efficacy profile, without giving much consideration to the associated economic burden with the armamentarium. Favorable operative conditions, use of the standardized protocol, aseptic conditions, and prohibition of money-making culture in the interest of patient care are the various factors which may effectively decrease the anesthetic cost. Literature quotes various studies that compare the economic feasibility of a drug reveals a comparison between total intravenous anesthesia and inhalational anesthesia prominently by direct cost measurements, which may lead to a faulty interpretation.^{6, 7} Hence, we comparatively evaluated the cost-effectiveness and recovery profile between propofol and sevoflurane in patients undergoing laparoscopic cholecystectomy.

Higher total anaesthetic cost was observed in group containing propofol as anaesthetic agent and it may be due to the amount of wastage caused by unused medicine, higher amount of cost required for its maintenance and additional burden for the cost required for disposable items like pressure monitoring line and syringes for intra-operative infusion. In sevoflurane group, the larger induction cost can be attributed to the drug consumption in priming the anesthesia circuit and higher fresh gas flow requirement for anesthetic induction. Cost of anaesthesia can be minimized in the surgeries of shorter duration by induction with propofol, and utilizing sevoflurane for maintenance, taking into account lowest cost of induction with propofol and minimal maintenance cost of anesthesia with

sevoflurane. Similar findings have been reported by Smith *et al.* who also compared sevoflurane and propofol.⁸ Singh *et al* evaluated and compared the recovery profile of propofol and sevoflurane in patients undergoing open cholecystectomy. They evaluated 60 patients who underwent elective cholecystectomy and randomly divided them into two groups. Group S and group P included patients who were maintained at sevoflurane anaesthesia and propofol infusion respectively. They observed no significant difference between the recovery profiles of the patients in the two study groups. From the results, they concede that for the maintenance of anaesthesia during major surgical procedures, performance of propofol is as good as that of sevoflurane.⁹ Yao *et al* compared the post-operative recovery effect of propofol target controlled infusion (TCI) and sevoflurane inhalational anaesthesia in patients undergoing laparoscopic cholecystectomy. From the results, they concluded that in the induction of good anaesthetic effect, Propofol TCI and sevoflurane inhalational anaesthesia are equally effective.¹⁰ Tang *et al* clinically compared and investigated the clinical and cost effectiveness of propofol and sevoflurane in office bases anaesthesia. They evaluated 104 patients who underwent surgical procedures and divided randomly into three groups. Group I, II and III included patients in which propofol, sevoflurane and combination of the two were administered respectively. They observed similarity in the early recovery results of all the three groups. From the results, they concluded that significantly more patients are dissatisfied by sevoflurane technique.¹¹ White *et al* comparatively evaluated the effect of desflurane and sevoflurane in maintenance of outpatient anaesthesia. They randomly analyzed 130 patients who underwent elective surgical procedures under general anaesthesia. From the results, they concluded that a higher incidence of coughing is associated with use of desflurane for maintenance of anaesthesia.¹² Liang *et al*

evaluated the post-surgical recovery effect of sevoflurane / propofol coadministration in comparison with sevoflurane in combined general/epidural anesthesia. They assessed 160 patients who underwent elective gastrointestinal surgery under combined general/epidural anesthesia and observed that in sevoflurane / propofol group, the incidence of serious coughing and agitation was lower in comparison to sevoflurane group. From the results, they concluded that in patients undergoing elective surgeries, faster awakening and extubation is provided by coadministration of propofol and sevoflurane.¹³ Pensado Castiñeiras et al compared the effectiveness of desflurane, sevoflurane and isoflurane in maintenance of anaesthesia during long elective surgeries. From the results, they concluded that in all the three drugs, the maintenance of anaesthesia was nearly comparable.¹⁴ Wallenborn et al compared the effect of inhalation anesthetics, sevoflurane, and desflurane on post-operative nausea and vomiting (PONV) in comparison with isoflurane. From the results, they concluded that regarding the severity of PONV in between the three inhalation anesthetics.¹⁵

CONCLUSION

In the light of above results, it can be concluded that in terms of cost-effectiveness, sevoflurane appears to be a better anaesthetic agent. Additional studies with more number of drugs and larger parameters are required in future for further exploring this field of medicine.

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