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ORIGINAL ARTICLE

Comparison Between Recovery Profiles of Total Propofol Anesthesia and Total Sevoflurane Anesthesia in Patients Undergoing Laparoscopic Cholecystectomy

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ABSTRACT

Objective: To compare propofol and sevoflurane anesthesia in terms of mean extubation time among patients undergoing laparoscopic cholecystectomy.
Study Design: Randomized Controlled Trial
Study Setting: National Hospital and Medical Centre, Lahore
Sampling Technique: Consecutive non-probability sampling
Study duration: 06-02-18 to 06-08-18
Methodology: The cases with age range of 16 to 60 years of either gender with ASA status 1 and 2 undergoing laparoscopic cholecystectomy were included. group A was given propofol and group B sevoflurane in standard dose and they were assessed for mean extubation time.
Results: In the present study there were total 60 cases with 30 in each group. There were 14 (46.67%) males in group A vs 16 (53.33%) in group B. The mean age in the group A was 40.03±13.68 years while in group B was 36.83±10.64 years. Mean BMI was 25.27±2.05 vs 25.43±1.85 in group A and B respectively. There were 19 (63.33%) cases in ASA class 1 in group A and 16 (53.33%) in group B. Mean extubation time in group A and B was 7.16±2.80 vs 3.68±0.87 with p= 0.0001. Mean time of extubation was significantly longer in group A in terms of gender, age and ASA class.
Conclusion: Mean extubation time was significantly shorter in group B managed by Sevoflurane as compared to Propofol and this difference was statistically significant in terms of all the variables in the form of age, gender and ASA class. Thus sevolflurane anaesthesia is superior to propofol.
Keywords: Anesthesia, Sevoflurane, Propofol, Extubation Time, ASA Status.

INTRODUCTION

Fast track anaesthesia and surgery is the need of time, of which laparoscopic surgeries are the most desirable and important component, so, to keep the pace up with the advancement in the field of modern day surgery a good anaesthetist needs to be very vigilant about what cocktail of anaesthetic and analgesic agents he/she should be using so that to provide adequate anaesthesia along with early emergence and good recovery profile.

Laparoscopic cholecystectomy is the most commonly done laparoscopic procedure nowadays in tertiary care hospitals. Over the last 3 decades, laparoscopic cholecystectomy has become the treatment of choice for patients with symptomatic gallstone disease. Indeed, it is safe to say that this procedure has significantly escalated the acceptance of minimally invasive surgery as a whole. The popularity of laparoscopic surgery rests in the range of advantages it has over the open procedures, including decreased need for post-operative analgesia, shorter recovery period and hospital stay, a lower rate of postoperative infections and incisional hernias, and cosmetic satisfaction caused by smaller incisions[1].

The invention of propofol in 1980[2] revolutionized the practice of anaesthesiology dramatically and the concept of ambulatory anaesthesia came into being, as it has short duration of action with minimum hangover effects, but its delivery through intravenous lines and titration makes its delivery quite complicated.

Later in 1990[2] sevoflurane was safely introduced for the public use, ten years after it was first synthesized, and it was a milestone in the history of anaesthesia due to its easy and fast induction and early recovery characteristics thus rendering it comparable to propofol for ambulatory/day- care surgeries.

In 2016 Keita Ohkushi et al[3], proved in their study that mean extubation time in Sevoflurane anaesthesia is lesser than propofol anaesthesia i.e. after the discontinuation of anesthetic agent delivery the mean extubation time was found to be 920 ± 537 sec with propofol and 595 ± 186 sec with Sevoflurane with a P value of 0.016, associating early emergence from anesthesia with Sevoflurane.In 2015 Yashpal Singh et al[4] established the role of sevoflurane as a better anaesthetic agent in terms of less mean extubation time and over all better recovery profile, it is further supported by Chaudhary Kriti et al[5] in 2016 as inhalational anaesthesia with sevoflurane provides better hemodynamic stability and early recovery compared to intravenous anaesthesia with propofol infusion. Sevoflurane provides a suitable alternative to propofol for anesthesia[5]. However there have been studies[6, 7] conducted which show that both the drugs have comparable mean extubation time and thus recovery profiles.

Keeping in prospect our healthcare setups and their patient load, less extubation time would ensure early recovery, reduced PACU (post anaesthesia care unit) stay and reduced hospital stay, as well as reduced patient morbidity due to delayed recovery and reduce the postoperative requirement of mechanical ventilation and postoperative respiratory complications[8].

Such an inconclusive literature on the subject impinged upon the need of conducting more research work in this particular subject. That's why I liked to do this study as the drugs under study are mainstay of fast track anaesthesia and this study has not yet been done in Pakistan. Moreover, with the help of this study we could be able to find an anaesthetic agent with a comparatively quick yet safe recovery from anaesthesia.

MATERIAL AND METHODS

Study Design: Randomized Controlled Trial
Study Setting: National Hospital and Medical Centre, Lahore
Study Duration: 06-02-18 to 06-08-18
Sample size: Using the study by Keita Ohkushi et al[3], the results of which showed mean extubation time, after the discontinuation of anesthetic agent, to be 920 ± 537 sec with propofol and 595 ± 186 sec with sevoflurane, this study is used as no premedication was used in this study and is thought to provide exact effect of the drugs under study. With the power of 95% and confidence interval of 95% the sample size (n) was calculated to be 60, i.e. 30 in each group under study.

Sample size (n): 60
Sampling Technique: Consecutive non-probability sampling
Sample Selection: **Inclusion Criteria**:

- ASA status 1 and 2
- Patient aged 16 to 60 years, scheduled to undergo laparoscopic cholecystectomy

Exclusion Criteria:

- Patients with already present mental deficits of any kind which may delay recovery.
- Patients with history of allergy to drugs under study
- Alcoholics and drug dependent individuals
- Obese patients with BMI > 30
- Pregnant women

Data Collection Procedure: Permission from hospital ethical committee was obtained. A written informed consent was taken from every patient in the study after explaining purpose of study and advantages and disadvantages of each technique used. Patients were selected from preanaesthetic clinic, randomized by computer and divided into two equal groups. The patients in Group A: propofol anesthesia, Group B: sevoflurane anaesthesia.

All the patients were attached to the monitor and their ECG, NIBP, $ETCO_2$, Pulse rate and SPO_2 was measured at baseline prior to inducing anesthesia. They were premedicated by injecting 0.1mg/kg dexamethasone and 0.15mg/kg metoclopramide as a prophylactic measure to reduce post op nausea vomiting and 0.1mg/kg inj.

After that Group A patients were induced by 1-2.5mg/kg propofol i.v inj. As the eyelash reflex is lost Atracurium 0.5mg/kg was injected and after 3 minutes the patient were intubated. This group was maintained at 100-200ug/kg/min propofol i.v through a peripheral line.

The other groups were induced at 8% sevoflurane and at the loss of eyelash reflex Atracurium 0.5/kg was injected and the patients were intubated after 3 minutes. After that the patients were maintained at 2% sevoflurane.

Depth of anesthesia was kept adequate by keeping the patient response to surgical stimulus (PRST) score < 3 and using the adequate maintenance doses of drugs.

Reversal was done by administering neostigmine 0.04 mg/kg with glycopyrolate 0.2mg per mg of neostigmine, once the patient started making one third of his/her adequate tidal volume. Trachea was extubated once the patient's own breathing pattern was re-established; patients were responsive to commands and after recovery of swallowing reflex. The time between the stoppage of delivery of anesthetic agent and extubation was noted by someone who was unaware to the procedure and drugs used to maintain anesthesia.

Data Analysis: After collecting all the data, it was analyzed using statistical package for social science (SPSS) version 22. Descriptive statistics were used to calculate quantitative and qualitative variables. Mean and standard deviation were calculated for quantitative variables i.e. Extubation time, height, weight, BMI and age. For qualitative variables i.e. gender and ASA status, frequency and percentages were calculated. Independent sample t-test was used to compare mean extubation time between the two groups. Effect modifiers like age, BMI, ASA status, were stratified and post stratification independent sample t-test between groups was used to compare the mean Extubation time.

P value< 0.05 was considered significant.

RESULTS

In the present study there were total 60 cases with 30 in each group. There were 14 (46.67%) males in group A vs 16 (53.33%) in group B. The mean age in the group A was 40.03±13.68 years while in group B was 36.83±10.64 years.. Mean BMI was 25.27±2.05 vs 25.43±1.85 in group A and B respectively. There were 19 (63.33%) cases in ASA class 1 in group A and 16 (53.33%) in group B.

Mean extubation time in group A and B was 7.16±2.80 vs 3.68±0.87 with p= 0.0001 as in table 01. Mean time of extubation was significantly longer in group A in terms of gender, age, BMI and ASA class as shown in tables 2-4

Table 1: Mean Extubation Time with Respect to Both Groups n= 60 (30 in each group)

	Group		p
	A	B	
Extubation time	7.16±2.80	3.68±0.87	0.0001

Table 2: Mean Extubation Time in Both Groups with Respect to Gender n= 60 (30 in each group)

Gender	Group		p value
	A	B	
Male	7.02±2.34	3.61±0.76	0.0001
Female	7.45±2.84	3.76±0.97	0.0001

Table 3: Mean Extubation Time in Both Groups with Respect to Age n= 60 (30 in each group)

Age	Group		p value
	A	B	
16-39	6.34±2.11	3.23±0.85	0.01
40-60	9.45±3.03	3.89±0.91	0.0001

Table 4: Mean Extubation Time in Both Groups with Respect to BMI n= 60 (30 in each group)

BMI	Group		p value
	A	B	
<25	7.01±2.34	3.63±0.83	0.0001
25 or more	7.79±2.97	3.75±0.89	0.0001

Table 5: Mean Extubation Time in Both Groups with Respect to Asa Class n= 60 (30 in each group)

Asa Class	Group		p value
	A	B	
I	7.12±2.31	3.69±0.86	0.0001
II	7.75±2.93	3.71±0.88	0.0001

DISCUSSION

In surgical patients, smooth and early emergence is a crucial concern. Early anaesthetic recovery enables early neurological testing and prompt postoperative intervention, if required. Because straining or coughing during anaesthesia emergence can induce haemorrhage, cerebrospinal fluid (CSF) leakage, and nasal pack dislodgment, it is especially crucial for patients with neurosurgical situations. To avoid airway blockage and restlessness in the post-extubation interval, these patients are only extubated when they are completely awake. To prevent difficulties, it is particularly desired for these patients to undergo an anaesthetic procedure that allows for early awakening and the clear use of higher mental functions..[9,10]

Short-acting anaesthetics are preferred as maintenance agents in these situations since they are the primary factors of the time of emergence and extubation. In order to accomplish the same, propofol, an intravenous (IV) anaesthetic drug with fast diffusion into peripheral tissues and minimal cumulative impact, has been employed frequently. Due to their low blood-gas partition coefficients of 0.65 and 0.42, respectively, sevoflurane and desflurane, both third-generation volatile anaesthetic drugs, have the virtue of allowing patients to quickly awaken from anaesthesia..[11,12]

In the present study the mean extubation time was longer in group A managed by Propofol as compared to group B where Sevoflurane was given and the extubation time was 7.16±2.80 vs 3.68±0.87 minutes in group A and B respectively with p= 0.0001. These results were similar to the result of the previous studies.

According to a study carried out in 2016 by Keita Ohkushi et al, also compared these two agents and they found that the mean extubation time in Sevoflurane anaesthesia was tend to be shorter than propofol anaesthesia and they assessed it in terms of seconds and it was noted to be as 920 ± 537 seconds with propofol as compared to 595 ± 186 seconds managed with Sevoflurane with a P value of 0.016.[13]

In another study done in 2015 by Yashpal Singh et al established the role of sevoflurane as a better anaesthetic agent in terms of less mean extubation time and over all better recovery profile, it is further supported by Chaudhary Kriti et al. In their study carried outin 2016, they compared IV anaesthesia to inhalational anaesthesia in terms of hemodynamic stability and early recovery and they found that intravenous anaesthesia given by propofol infusion had more BP variability and also the mean extubation time was longer the sevoflurane.[14,15]

There were few other studies that did not find a significant difference and found that both of these drugs were comparable in terms of mean extubation time[16,17. The] variability of these results can be due to difference in the patient characteristics as it can be more fluctuant in cases with number of co morbid conditions.

According to another study done by Sudre E et al it was seen that it was observed that mean extubation time, stay in the post anaesthesia care unit (PACU), over all length of the hospital stay and the risk of morbidity in these cases due to delayed recovery in terms of development of various respiratory symptoms and the need of ventilation was significantly lesser in case with sevoflurane than propofol (p= < 0.05 in all variables).[18]

In this study this was observed that mean time of extubation was significantly longer in group managed by Propofol as compared to Sevoflurane in terms of all the study variables like gender, age and ASA class The other studies have also shown this drug (sevoflurane) as better agent in terms of different confounding variables ($p < 0.05$) and furthermore, they also observed that the side effect profile was also higher with propofol and especially the highest cases were seen with hypotension which was attributed to its negative ionotropic and vasodilator effect on body and as compared to this no effect by sevoflurane on hemodynamics.[19,20]

The studies done by Robbinson et al and Hicker et al also found Sevoflurane better especially in male gender and those with surgery of longer duration of time and it was seen that response to verbal commands was 3 to 4 minutes earlier in cases given sevoflurane than those managed by propofol.[21,22]

A little conflicting results were seen by the study done by Arar et al where they found that there was no significant difference between these two groups and propofol was as effective as sevoflurane in terms of extubation times, response to commands and post operative length of hospital stay, however, the cases with hypotension were more seen in those where propofol was administered.[23]

The other studies have also shown the comparable effects on emergence hypertension in cases with slight rise in mean arterial pressure. In various studies this effect was equivocal in cases with propofol, sevoflurane and desflurane.[24,26]

There were many strengthening points as well as this study compared the two most commonly used drugs in the operation theatres and revealed results in their outcomes to choose the better one.

CONCLUSION

Mean extubation time was significantly shorter in group B managed by Sevoflurane as compared to Propofol and this difference was statistically significant in terms of all the variables in the form of age, gender and ASA class.

Practical Implications: This study suggests that Sevoflurane anesthesia could be used step by step in other settings as well to reduce the patient's extubation time and in return it will benefit in the patients recovery time.

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