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ORIGINAL RESEARCH

Recovery profile of patients undergoing laparoscopic cholecystectomy: A comparison between sevoflurane and propofol using Trieger Dot Test

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Abstract

Introduction: Minimal invasive surgery is beneficial due to a smaller incision, reduced postoperative pain which reflect in patient's earlier return to normal routine and work activities. Expeditious recovery and shorter hospital stay help to improve efficiency of an ambulatory facility and reduce costs. Major factor that determines the early recovery from anaesthesia is choice of anaesthetic technique. Sevoflurane, an inhaled anaesthetic, offer the potential for rapid recovery from anaesthesia. However, with the introduction of propofol, there is increased interest in total intravenous anaesthesia (TIVA). Hence, we decided to study comparison of recovery profile between propofol and sevoflurane in patients undergoing laparoscopic cholecystectomy.

Aim: To compare efficacy of Propofol&Sevoflurane in providing early & intermediate recovery in patients undergoing laparoscopic cholecystectomy.

Method: After approval from institutional ethics committee and obtaining written informed valid consent, we conducted this study in 90 patients of ASA I & II, age between 18 to 60 years and weighing 40-80 kg. Patients were given Trieger Dot Test 3 times in holding area preoperatively and average score taken as baseline score. Induction was done with injection propofol. Maintenance was done with propofol in P group and with sevoflurane in S group. After surgery all patients were observed in PACU till modified Aldrete score becomes 6. Once patient achieve Aldrete score of 6 we took up Trieger Dot Test till they achieve baseline score at interval of 15 minutes. End result was calculated by comparing percentage of dots omitted at particular time (15, 30, 45min) in both groups.

Results: Time to achieve Aldrete score of 6 was higher in P group. But Comparison of total duration to achieve baseline score between the two groups shows that it is higher in GROUP S.

Conclusion: Patients maintained on propofol will achieve recovery early compared to sevoflurane in laparoscopic cholecystectomy.

Key Words: Trieger Dot test, Intermediate recovery, Early Recovery

Introduction

Laparoscopic Cholecystectomy is the second most common day-care procedure performed [1]. It is a new method for the treatment of gall stone disease [2]. Minimal invasive surgery holds an important position in today's practice. A large number of surgical procedures are performed

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by minimum invasive method with laparoscopic cholecystectomy being one of the most popular. The benefits of doing laparoscopic cholecystectomy compared with open surgery are well known [3]. Laparoscopic operative procedures have revolutionized surgery with many advantages: a smaller and a more cosmetic incision, reduced blood loss, reduced postoperative stay and pain, decreased risk of surgery and anaesthesia related complications, which is reflected in patient's earlier return to normal routine life and work activities[4]. This is widely accepted and adopted by surgical community and has become new "gold standard" for management of cholelithiasis[5]. One of the major factors that determine the speed of recovery from anaesthesia is the choice of anaesthetic technique [6]. General anaesthesia is still the most common anaesthetic technique [7, 8]. Inhalational anaesthesia techniques remain the mainstay of modern anaesthesia practice. It is believed that inhaled anaesthetic technique allows rapid emergence from anaesthesia, probably because of ease of titratability, and exerts some neuromuscular blocking effect [9], which may reduce the requirements of nondepolarizing muscle relaxants. [10]. Sevoflurane, a newer shorter-acting inhaled anaesthetic offer the potential for rapid recovery from anaesthesia. However, with the introduction of propofol and newer delivery systems (e.g., target-controlled infusion), there is increased interest in total intravenous anaesthesia (TIVA). [11] Of all currently used anaesthetics, the physical, pharmacodynamic, and pharmacokinetic properties of sevoflurane come closest to that of the ideal anaesthetic [12]. As a result, sevoflurane has become one of the most widely used agents in its class. Postoperative Nausea and Vomiting (PONV) are common phenomenon after laparoscopic cholecystectomy, with a reported incidence from 53% to 72%. [13,14] Because of the multifactorial etiology of PONV and its occurrence associated with anaesthetic techniques, there has been an increasing interest in using prophylactic antiemetic and anaesthesia with intravenous anaesthetic agents like propofol, with known antiemetic properties. The association of PONV with propofol is less than 10%. The recovery characteristics (awakening extubation and orientation) of propofol are comparable with inhalational agents like desflurane and sevoflurane. [15, 16]. Hence, we decided to conduct this double blinded prospective trial designed to study comparison of recovery profile between propofol and sevoflurane in patients who underwent laparoscopic cholecystectomy.

Material & methods

After approval from institutional ethics committee and obtaining written informed consent, we conducted this prospective study in 90 patients of ASA I & II age between 18 to 60 years, weighing 40-80 kg undergoing laparoscopic cholecystectomy surgeries. During pre-anaesthesia check-up patients were informed about the study and their consent was obtained. These Patients were allocated randomly into two groups based on a computer-generated table of random numbers, Group P - Propofol group & Group S – Sevoflurane Group.

- All the patients who gave consent were explained Trieger Dot Test (TDT) and asked to take up the test three times in holding area. Average of these reading was considered as baseline value for that patient.
- They were premedicated with injection glycopyrrolate 0.004 mg/kg, injection Midazolam 0.03 mg/kg, injection fentanyl 2ug/kg.
- Induction of anaesthesia was carried out by using 2.0 mg/kg Propofol over 10 min.
- End point of induction was taken as loss of eye-lash reflex or apnoea. Bag-mask ventilation was confirmed and neuromuscular blockade done with injection vecuronium 0.1 mg/kg.
- After 3 minutes of bag mask ventilation trachea was intubated with no.7.5 Fr endotracheal tube for females and no. 8.5 Fr. for males.
- In Group-P, anaesthesia was maintained with infusion of Propofol 200 microgram/kg/min., started immediately after the bolus induction dose and in Group-S

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with Sevoflurane 2%, started immediately after induction. In both groups, the muscle relaxant was repeated in a dose ¼th of the initial intubating dose, when second twitch appears on TOF. At the end of surgery, the anaesthetic agents were terminated without tapering in both groups. Residual neuromuscular blockwas reversed with injection neostigmine 0.05mg/kg and injection glycopyrrolate 0.008mg/kg when therewere four twitches on TOF stimulation.

- Trachea was extubated after confirming that patient satisfies all criteria for extubation. During procedure we noted time of induction, time of start of surgery, time of end of surgery, time of spontaneous breathing ,time of extubation , time of spontaneous eye opening , time to state name and father`s name.
- All the patients were observed in operation theatres for 10 minutes after which they were transferred to Post-anaesthesia Care Unit (PACU). In the (PACU), Patients were assessed at interval of 10 min till to achieve modified Aldrete score of 6.
- Time duration to achieve Aldrete score 6 was recorded in each group. After getting Aldrete score of 6, intermediate recovery was assessed using TDT for psychomotor function. A score was assigned according to the number of dots omitted. we took up Trieger Dot Test till they achieved preoperative score at interval of 15 min. End result was calculated by comparing percentage of dots omitted at particular time (15, 30, 45min) in both groups.

Statistical analysis

All the gathered information were recorded in a computer and were analysed using SPSS version 2.0. Quantitative data were presented with the help of Mean and Standard deviation. Comparison among the study groups was done with the help of unpaired t test asper results of normality test. Qualitative data was presented in frequency and percentage. Association among the study groups was assessed with the help of Student ‘t’ test, Mann Whitney test and Chi-Square test. ‘p’ value less than 0.05 was taken as significant.

Results

Demographic data like age, sex, weight, Body Mass Index were compared using appropriate statistical tests and found to be comparable.

Duration of surgery was also compared between the two groups and found to be comparable.

When Time of Reversal was compared it was found that Group P had more time of reversal and it was statistically significant (p=0.011).

Table 1: Independent t test for comparison of time of reversal between two groups

	Group	Sample size	Mean	Standard deviation	t	Df	P value
Time of reversal	Group P	45	9.110	3.669	2.615	88	0.011
	Group S	45	6.670	5.086			

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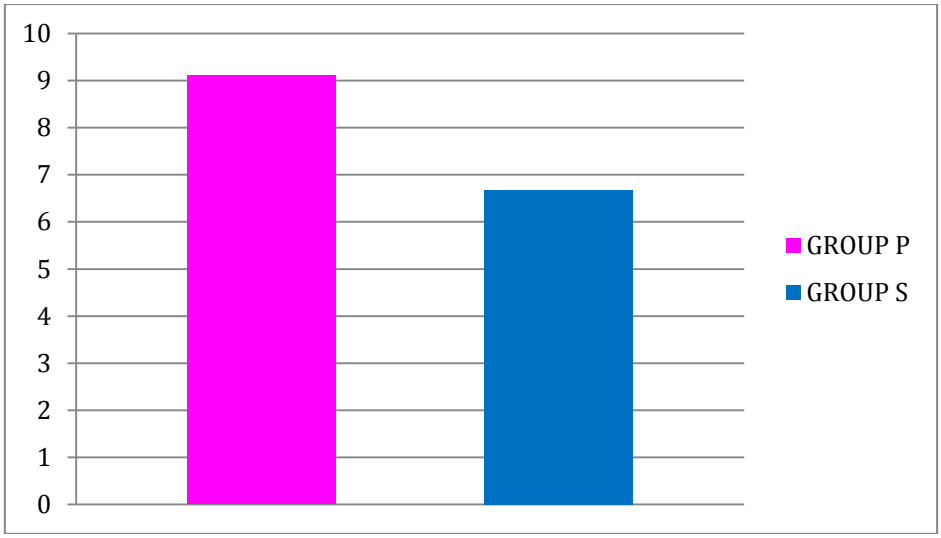
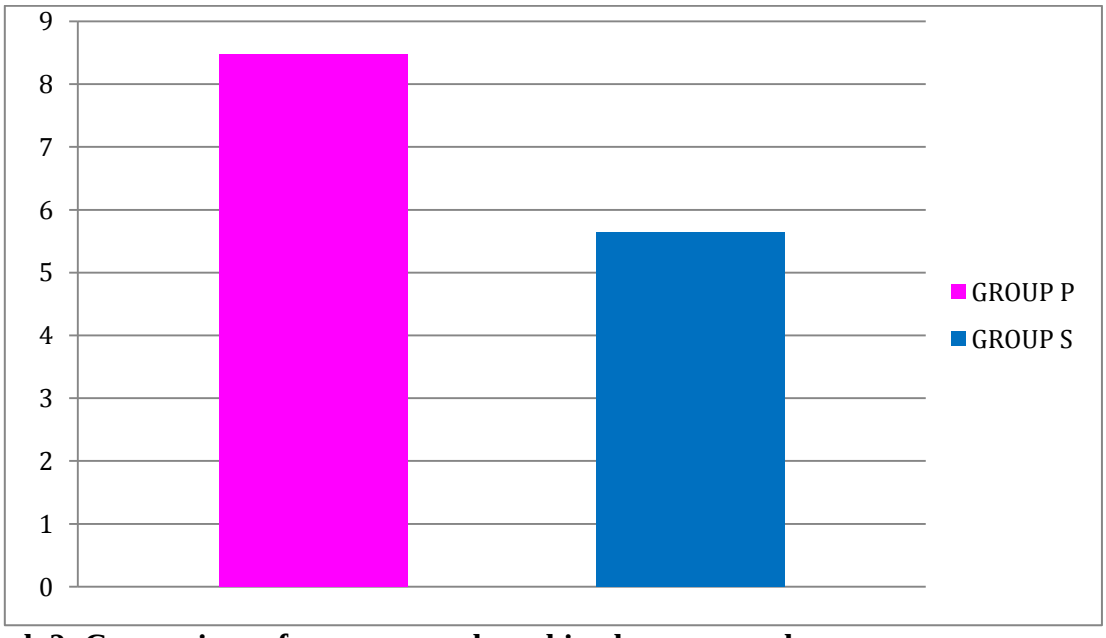


Graph 1: Comparison of time of reversal among study groups

Time to spontaneous breathing was higher in group P. (p=0.002)

Table 2: Independent t test for comparison of time of spontaneous breathing between two groups

	Group	Sample size	Mean	Standard deviation	t	Df	P value
Time of spontane-ous breathing	Group P	45	8.470	3.481	3.272	88	0.002
	Group S	45	5.640	4.623			



Graph 2: Comparison of spontaneous breathing between study groups.

Time to extubation was found to be higher in group P. (p=0.01)

Table 3: Independent t test for comparison of time of extubation between two groups

	Group	Sample size	Mean	Standard deviation	T	Df	P value
Time of extubation	Group P	45	11.710	4.214	2.664	88	0.01
	Group S	45	8.840	5.927			

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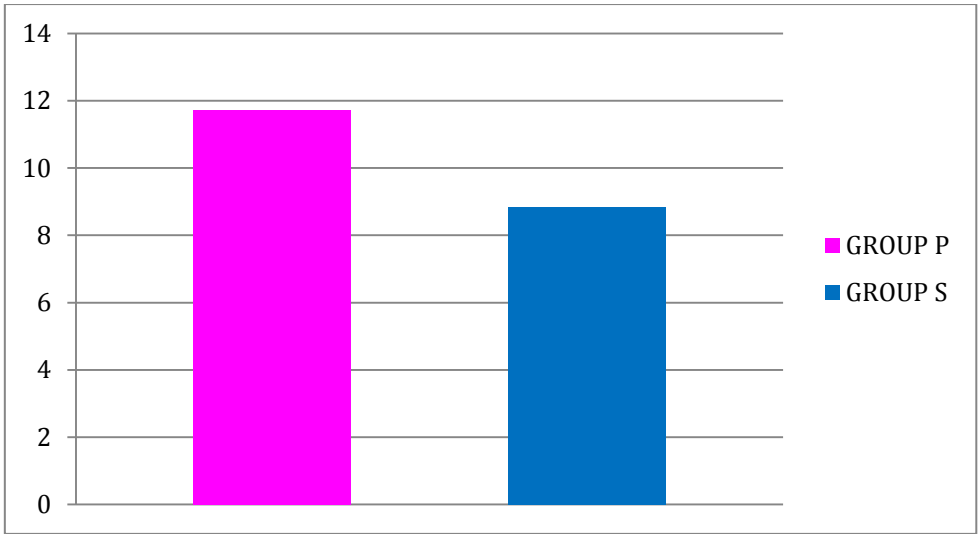
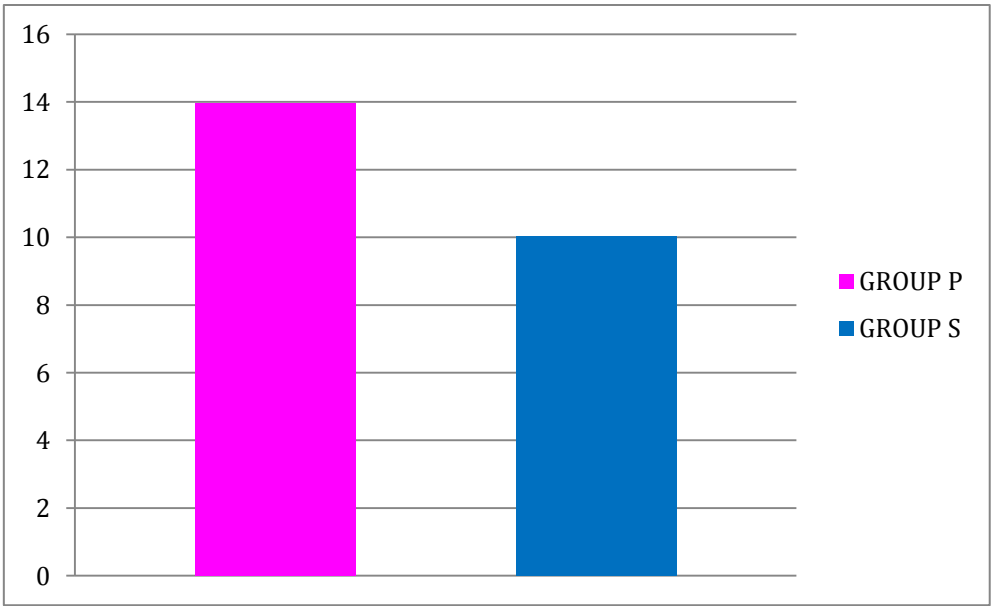


Graph 3: Comparison of time of extubation between study groups.

Time to eye opening was found to be higher in group P.(p=0.001)

Table 4: Independent t test for comparison of time of eye opening between two groups

	Group	Sample size	Mean	Standard deviation	T	Df	P value
Time of eye opening	Group P	45	13.960	4.572	3.358	88	0.001
	Group S	45	10.040	6.335			



Graph 4: Comparison of time of spontaneous eye opening between study groups.

Time to state name was higher in group P and was statistically significant (p=0.002)

Table 5: Independent t test for comparison of time to state name between two groups

	Group	Sample size	Mean	Standard deviation	T	Df	P value
Time to state name	Group P	45	16.490	4.635	3.126	88	0.002
	Group S	45	12.730	6.593			

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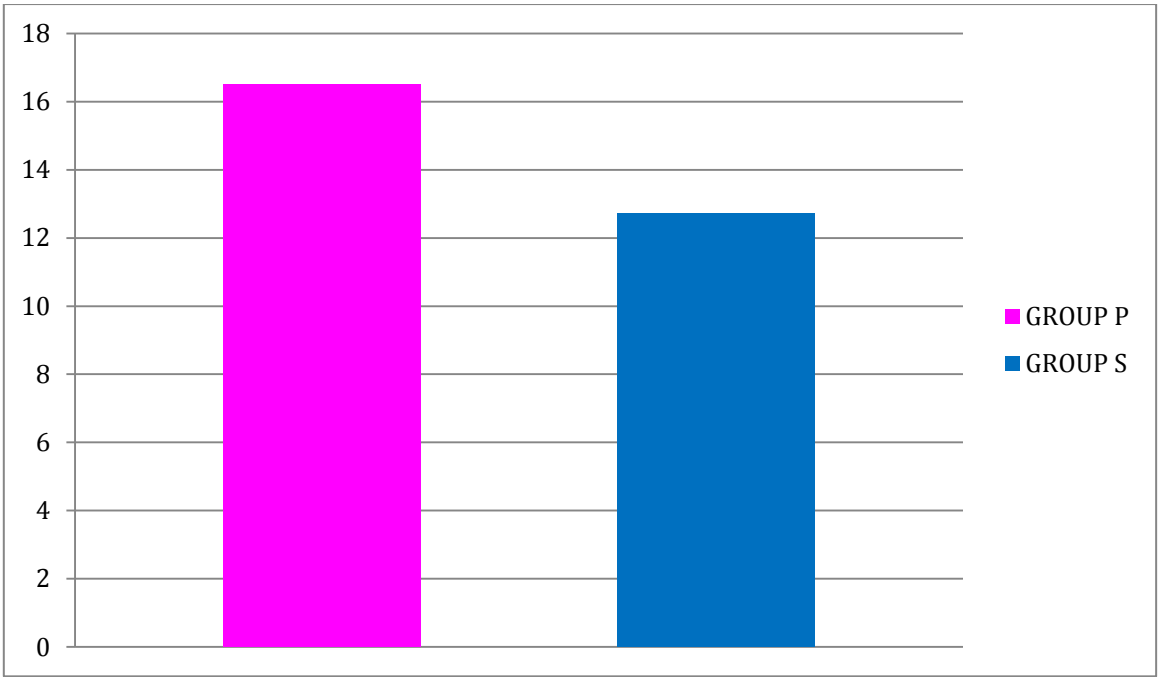
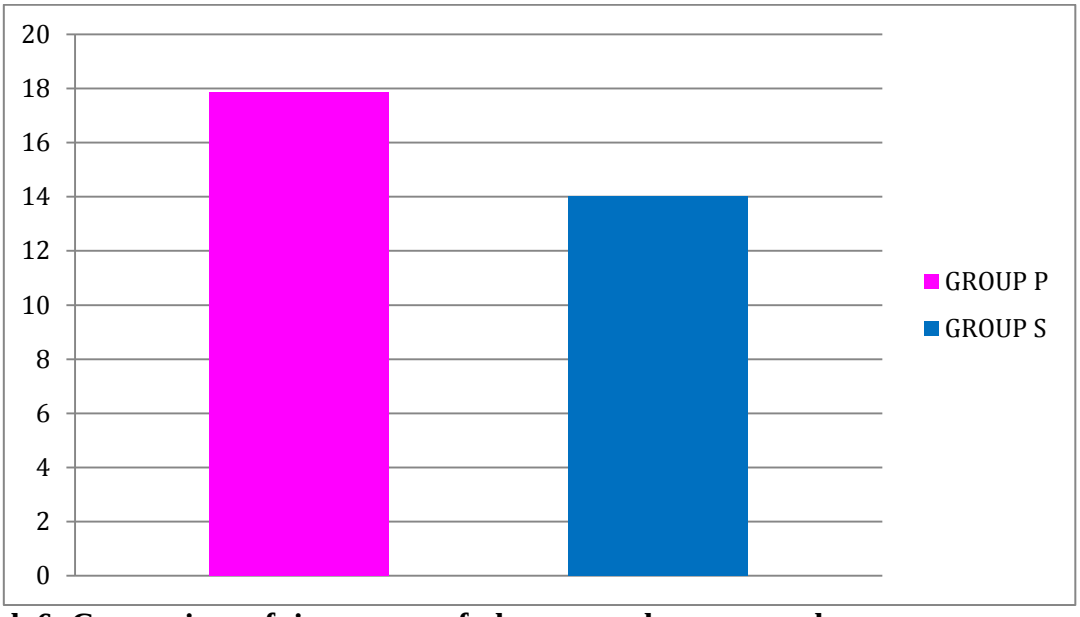


Graph 5: Comparison of time to state name between study groups.

Time to state Fathers name was higher in group P and was statistically significant. (p=0.003).

Table 6: Independent t test for comparison of time to state fathers name between two groups

	Group	Sample size	Mean	Standard deviation	T	Df	P value
Time to state fathers name	Group P	45	17.870	5.048	3.044	88	0.003
	Group S	45	14.020	6.804			



Graph 6: Comparison of time to state fathers name between study groups.

Time to achieve Aldrete score of 6 was higher in P group and was statistically significant. (p=0.031).

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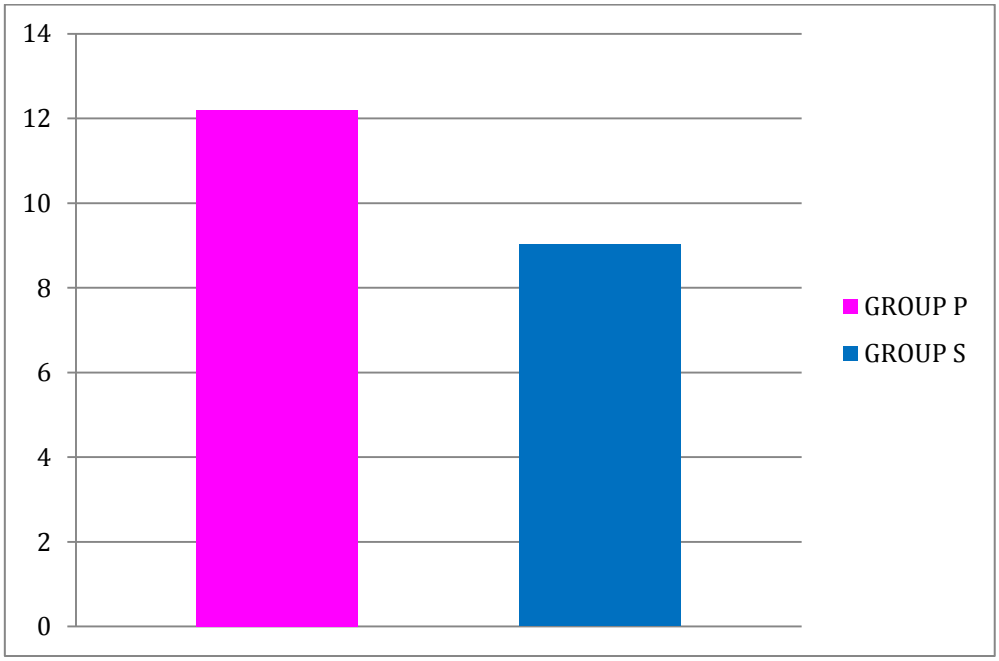
Table 7: Independent t test for comparison of time to achieve Aldrete score 6 between two groups

	Group	Sample size	Mean	Standard deviation	T	Df	P value
Time to achieve aldrete score 6	Group P	45	12.200	7.159	2.195	88	0.031
	Group S	45	9.020	6.563			



Graph 7: Comparison of time to achieve Aldrete score 6 between study groups

Table 8: Independent t test for comparison of number of dots missed at time interval using trieger dot test between the two groups

	Group	Sample size	Mean	Standard deviation	t value	df	P value
Trieger Dot Test At Aldrete Score 6	Group P	45	27.310	6.127	-1.561		0.122
	Group S	45	29.580	7.569			
TRIEGER DOT TEST AT 15min	Group P	45	19.270	5.172	-5.512	88	**<0.001**
	Group S	45	26.020	6.391			
TRIEGER DOT TEST AT 30min	Group P	45	13.560	5.533	-6.073	88	**<0.001**
	Group S	45	21.470	6.764			
TRIEGER DOT TEST AT 45min	Group P	42	8.550	5.214	-7.181	85	**<0.001**
	Group S	45	16.670	5.321			
TRIEGER DOT TEST AT 1hr	Group P	32	7.220	20.910	-1.279	75	0.205
	Group S	45	11.380	5.412			
TRIEGER DOT TEST AT 1hr15min	Group P	12	1.330	2.462	-5.496	35.711	**<0.001**
	Group S	42	6.930	4.724			
TRIEGER DOT TEST AT 1hr30min	Group P	0a	.	.			
	Group S	32	3.530	3.784			

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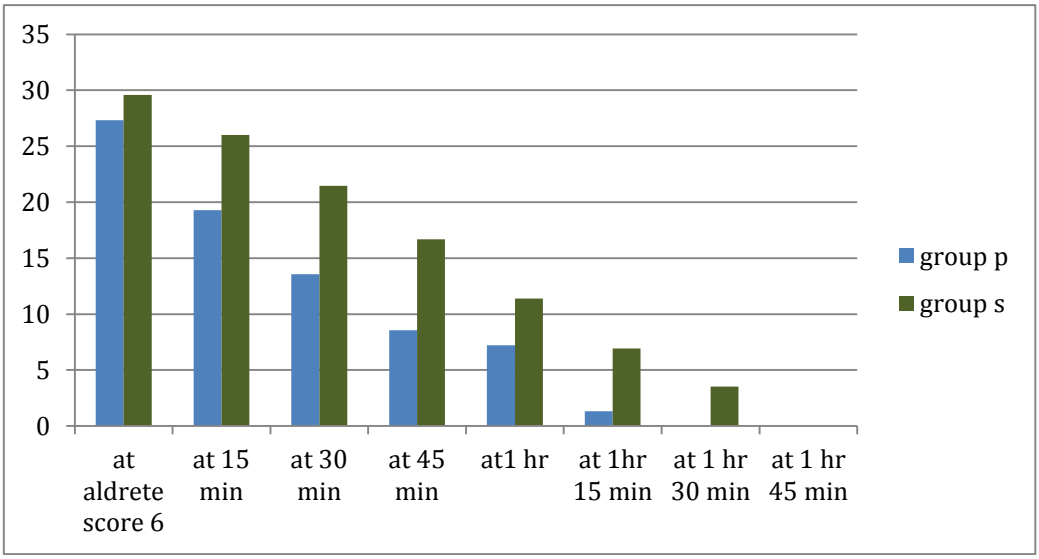
TRIEGER DOT TEST AT 1hr45min	Group P	0a	.	.			
	Group S	14	1.290	1.858			
A t cannot be computed because at least one of the groups is empty.							

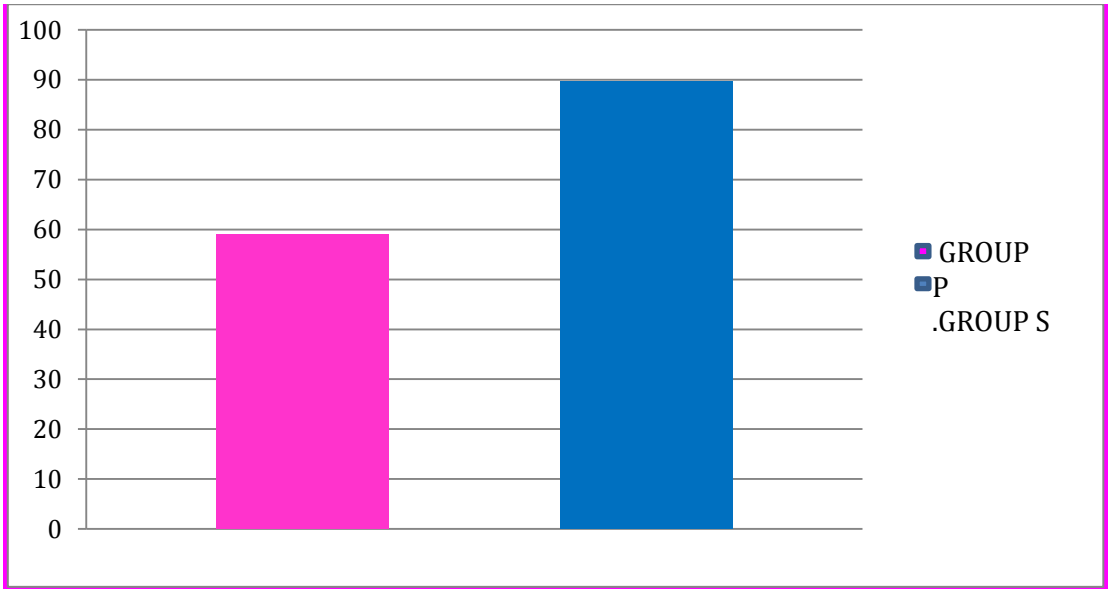


Graph 8: Comparison of number of dots missed at time interval between two groups.

Above graph shows that in Triger Dot test performed at various time intervals after achieving Aldrtete score of 6, Group S had significantly more missed dots as compared to Group P .

Table 9: Independent t test for comparison of duration to achieve baseline score

	Group	Sample size	Mean	Standard deviation	t	Df	P value
Time to achieve baseline score	Group P	45	59.000	13.34	-10.59	88	<0.001
	Group S	45	89.667	14.118			



Graph 9: Comparison of time duration to achieve baseline score

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Above graph shows that time to achieve baseline score on Triger Dot Test was higher in Group S as compared to group P. ($p<0.001$)

DISCUSSION

Day care surgery is described as the admission of patients for a planned surgical procedure, returning home same day after the operative procedure [17]. The fast pace of life, need for early return to work, and desire for early resumption of daily routine to maintain social and professional competitiveness, are few of the important factors which have propelled this treatment modality to newer heights. [18,19]Latest advancement in the field of laparoscopic surgery is the introduction of Day Care surgery. [20]

Availability of newer and better intravenous anaesthetic agents such as propofol and midazolam and adjuvants such as remifentanil and dexmedetomidine has almost replaced inhalational agents in the era of day‐care clinical practice. Propofol is the major contributory anaesthetic agent in the rapid evolution of day care surgery due to its superior recovery characteristics. [21,22]

In our study participants were comparable with respect to their demographic data viz.age, sex, weight, body mass index etc.

Duration of procedure has a direct bearing on outcome as far as the recovery is concerned. This is because the total amount of drug given will be more and may take longer time to clear from body. Motsch J et alstudied comparison of the use of sevoflurane and propofol in ambulatory surgery. Study showed that neither the study groups nor the duration of surgical procedures differed significantly [23]. In our study we found more duration of procedure in P group compared to S group but this was not statistically significant. This is consistent with Brian Fredman et al [24], Motsch J et al [23], K. Nelskyla, K. Korttila and A. Yli-Hankala[25] studies**.**

Recovery is the most important aspect during postoperative period as the discharge of the patient from the hospital on day care basis is decided after evaluating recovery characteristics.

We recorded time to extubation, spontaneous breathing, spontaneous eye opening, state name, state father`s name at the end of surgery to assess early recovery. Like our study , ZeynepNur Orhon[26] , Motsch J et[23] **,**Hepağuşlar Het al[27] , Brian Fredman et al[60] used similar parameter to assess early recovery**.**

We found that time to early recovery is higher in propofol group as compared to sevoflurane group.Motsch J et al[23],andZeynepNur Orhon[26] studied recovery with propofol versus sevoflurane and their findings were similar to our study.Brian Fredman et alfoundno difference in time for emergence with respect to spontaneous eye opening, response to verbal commands, extubation, and to correctly state name, age, and date of birth.They did this study in gynaecologic and otolaryngologic procedures. they used 75-160 µg/kg/min propofol& l%-4% end-tidal sevoflurane for maintenance. In our study we used 200mcg/kg/min of Propofol infusion & 2% end tidal sevoflurane tapered according to hemodynamics of patient. Use of different concentration for maintenance of anaesthesia could be the probable reason for different study results. [24]

Numerous scoring systems are used for early recovery assessment. Clinical recovery score, Stewart recovery scores, Aldrete score (AS), post anesthesia discharge scoring systems (PADSSs) etc. have been developed to monitor patients before discharge from the hospital after ambulatory surgery and are being commonly used.[28,29]

M.S. Maqbool, M.U.Draz, A.S.Shahani evaluated recovery patterns in post- operative patients using fast-track criteria and modified Aldrete scoring system .They concluded that the Fast-Track scoring criteria 1, 2, 3 along with Modified Aldrete score of 4 offers guidance

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in deciding safe discharge from recovery room. This lead to decrease hospital stay &morbidity. [30]

Hence, with above reference we used Modified Aldrete scoring system for assessment of depth of sedation and decided to take minimum Aldrete score of 6 as reference to subject patients to Trieger dot test.

TIME TO ACHIEVE ALDRETE SCORE = 6

Our study results showed that time to achieve Aldretescore 6 is higher in propofol group as compared to sevoflurane group. Our study results were concurrent with MukeshSomvanshi et al [31].

ZeynepNurOrhon study differ from our study as they used propofol infusion at 3-12 mg/kg/hr or 0.5-2 % of sevoflurane for maintenance whereas we started propofol infusion at rate of 200 mcg/kg/min and sevoflurane at 2% for maintenance. The concentration of sevoflurane used and the infusion rate of propofol were adjusted according to an EEG target value of 40-60 for BIS. In our study where we adjusted concentration according to hemodynamics. Measuring depth of anaesthesia by objective criteria is better which we could not do [26]

Brita Larsen et alstudy showed thatremifentanil-propofol group showed significantly faster emergence and awakening in the early recovery phase than patients receiving desflurane or sevoflurane. This is different than our study results because Brita Larsen et al used remifentanil in addition to propofol for maintenance. Remifentanil produces cumulative effect with propofol, so propofol dose required to produce desired effect decreased. Rapid elimination of remifentanil causes early recovery. [32]

INTERMEDIATE RECOVERY

There are many tests that are used for studying psychomotor recovery and some have been shown to be reliable and useful in terms of both accuracy and objectivity. Perceptive accuracy test, choice reaction time, peg-board test, card sorting test, finger tapping and Trieger dot test are some of them to give an example.

J.E. Letourneau evaluated reliability and validity of the Trieger dot test as a measure of recovery from general anaesthesia in a day-care surgery unit. He did his study on 23 patients who were investigated after general anaesthesia for evaluation of intermediate recovery. He evaluated patients four times, first test was given before induction of anaesthesia in order to determine baseline performance; the same routine was repeated 90min, 150min and 210min after the end of the period of anaesthesia. The study showed that Trieger Dot Test is reliable [33].

Hence, we chose Trieger Dot Test (TDT) as it is simple to perform and has been validated for its reliability.

We subjected patients to Trieger dot test once they achieve Aldrete score ≥ 6 and continued every 15 min interval until they achieve baseline score.

We found that duration to achieve baseline score was higher in sevoflurane group compared to propofol group at different time intervals.

Thus, our study showed that propofol offers a clinically important advantage with respect to an earlier return of cognitive function compared with sevoflurane. Time for awakening and time to achieve an Aldrete score of 6 were a few minutes less for sevoflurane compared with propofol. This showed that sevoflurane patients were much less sedated, more alert and could be transferred from the operating room to the post anaesthesia recovery room earlier and improve the efficiency in a busy operating area. However, of much greater importance are the differences in intermediate recovery or cognitive function between propofol and sevoflurane. The results indicate that, return of cognitive and psychomotor function in the first 60 min

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after anaesthesia is faster following propofol than after sevoflurane. So, we conclude that patients maintained on propofol will achieve street fitness early compared to sevoflurane in laparoscopic cholecystectomy.

LIMITATIONS OF STUDY

In our study the depth of anaesthesia was titrated to hemodynamics
And response to surgical stimuli. We did not use any objective data for measuring depth of anaesthesia. Usage of objective parameters of depth monitoring like BIS monitoring, Entropy monitoring is recommended.

CONCLUSION

1. Patients maintained on sevofluranegroup showed early recovery compared to propofol. Patients maintained on sevoflurane group achieve Aldrete score early compared to propofol.
2. Patients maintained on propofol group showed early achievement of cognitive function assessed with Trieger dot test compared with sevoflurane group.

Thus, we conclude that patients maintained on propofol infusion show better intermediate recovery compared to sevoflurane. So propofol infusion can be used in providing anaesthesia in day care laparoscopic surgeries and fast tracking the patient recovery.

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