

Post- Operative Recovery Profile after Laparoscopic Cholecystectomy: Comparing Inhalational Versus Intravenous Anaesthetic Regimen

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Abstract

Background: To compare inhalational anaesthetic regimen with intravenous regimen with regard to post operative recovery after laparoscopic cholecystectomy

Methods: In this comparative study 166 patients were selected by lottery and assigned into two groups. Induction was done with sevoflurane 8% in 50% nitrous oxide in oxygen (group-A) and propofol 2mg/kg (group-B). All patients had volume controlled ventilation and standard monitoring. Before shifting Fast Track criteria was used inside operating room and Post Anaesthesia Discharge score employed in recovery area. Spearman's Rank correlation was used to check interdependence between the two recovery scores i.e. Fast-Track criteria and Post Anaesthesia Discharge score in both groups.

Results: Fast track criteria and post op anaesthesia scores were equal in both groups. Inhalation induction (group-A) was slightly slower as compared to intravenous induction with propofol (group-B) but a higher incidence of un-expected movement/cough was noted during propofol induction as compared to sevoflurane. ASA physical status classes of both groups are identical. Though different anaesthesia techniques were used in both groups while standardizing anaesthetic maintenance factors and per-operative medications, no clinical superiority in recovery times was noted in ambulatory laparoscopic cholecystectomy. The value of correlation co-efficient (r) was .372 and .556 respectively in both groups and significant at 0.01 level.

Conclusion: Use of either intravenous (propofol) and inhalational (sevoflurane) anaesthetic regimen do not have any clinical superiority on patterns of anaesthetic recovery in ambulatory laparoscopic cholecystectomy.

Key words: Sevoflurane, Propofol, Laparoscopic cholecystectomy, Fast Track criteria.

Introduction

In current era, ambulatory surgeries demand speedy recovery. This clinical investigation is designed to foresee clinical recovery patterns employing inhalational and intravenous anaesthetic regimen in patients undergoing ambulatory laparoscopic cholecystectomy. In England, a rising trend has been observed in ambulatory surgery from 34% (1989) to 49% (2001-2002)¹. They have cost saving potential, with the busy elective surgery schedule. The need arises of safer recovery from general anaesthesia requiring endotracheal intubation. Anaesthetic recovery is a running process with early stages converge with the end of operative anaesthesia. The attainment of full pre-operative physiological status from general anaesthesia takes minutes to days. It consists of various phases². The Phase-I, blankets patient's emergence from anaesthesia and continues into the post anaesthesia care unit, Phase-II is when the patients are shifted to respective wards and achieves criteria for discharge, finally full psychological as well as physiological Phase-III recovery occurs at home. These phases symbolize the level of care at each respective area. According to latest protocol "fast tracking" in ambulatory surgeries refers to bypassing the post-anaesthesia care unit by shifting patient directly to step down phase II recovery area. For this purpose, various criteria have been described for objective assessment of recovery progress from general/regional anaesthesia with varying validity and reliability. These include Fast-Track criteria, Modified Aldrete scoring system, Post Anaesthesia Discharge score, Aldrete score and others.³⁻⁹ Some tests are used for the assessment of early recovery, while others are used to assess

recovery of patient before shifting to surgical ward from post anaesthesia care unit or home readiness as in day case surgery. Though fast tracking can be reliably accomplished after procedure done under monitored anaesthesia care, the use of general anaesthesia represents greater challenges because of residual anaesthetic effects and more frequent incidence of side effects.^{10,11}

Cumulative index of White P and Song D proposed fast-track scoring system requiring a minimal score of 12 (with no score < 1 in any individual category) to assess phase-I recovery and post-anaesthesia discharge score to measure discharge readiness from post-anaesthesia care unit to ward/surgical intensive care requiring an optimal score of >9 out of 10, along with influence of two induction techniques i.e. intravenous (propofol) and inhalational (sevoflurane) in patients undergoing balanced general anaesthesia with endotracheal tube placement in ambulatory laparoscopic cholecystectomy.^{8,12} This will help in appropriate assessment of recovery from anaesthesia and provide guidance so as to immediately take appropriate necessary actions for better and optimal patient management and to ensure safe discharge of patient. Spearman's Rank correlation was used to check interdependence between the two recovery scores i.e. Fast-Track criteria and Post Anaesthesia Discharge score⁸ in both groups.¹²

Patients and Methods

The study was conducted at Rawal General and Dental Hospital, Islamabad, from Oct-2017 to Oct-2018. Patients were selected by lottery and were assigned equally into two groups. Patients belonged to American Society of Anaesthesiologist (ASA) class I, II and medically optimized class III and IV.¹³ Anaesthesia was started by co-induction in all cases with (midazolam and nalbuphine) followed by two anaesthetic treatment regimen i.e. group-A (sevoflurane 8% in 50% nitrous oxide in oxygen) inhalational and group-B (propofol 2mg/kg) intravenous induction. Anaesthetic maintenance in both groups was with sevoflurane 2% with 50% nitrous oxide in oxygen employing circle anaesthesia system, with volume controlled ventilation. Haemodynamic and anaesthetic variables were recorded before anaesthetic administration and at a minute interval from induction of anaesthesia until 5 minutes and thereafter at 5 minutes interval till end. Tracheal intubation was facilitated by 0.5mg/kg atracurium or 0.15mg/kg cis-atracurium. Anaesthetic induction time was noted (minutes) i.e. time for

unconsciousness, to completion of intubation and any associated event like unexpected movement, difficult intubation and use of stylet was noted. Injection ranitidine 50mg and paracetamol 1gm were used as prophylactic for peptic ulcer and analgesia. Local anaesthetic was infiltrated at port sites at end of surgery in all cases. Sevoflurane was discontinued at application of last suture (100% oxygen continued) and recovery time was determined from discontinuation of sevoflurane to use of reversal agents, awakening, extubation, full orientation and return of protective airway reflexes. All patients received ondansetron 4 mg both at induction and at anaesthetic recovery time, along with dexamethasone 8mg at start as anaesthetic adjunct. Fast track criteria assessment was done inside operating room before shifting to post-anaesthesia care unit where hemodynamic monitoring and clinical observation continued.¹² Patients were reassessed by post-anaesthesia discharge score⁸ before shifting to ward/intensive care. Spearman's Rank correlation was used to check interdependence between the two recovery score variables i.e. Fast-Track criteria and Post Anaesthesia Discharge score in both groups.^{8,12}

Results

In the study gender ratio, in group-A and B, was male 19(22.89%) and 64(77.10%) and female 16(19.27%) and 67(80.72%) respectively. In both groups, four cases (4.8%) out of 83 cases needed top-up analgesia in post-anaesthesia care unit. Fast track criteria and post op anaesthesia scores were equal in both groups (Table 1).

Table-1: Demographics.

	Mean	Mode	SD	Minimum	Maximum
Group A/B					
Age(yrs)	45.25/45.07	40/40	14.76/14.21	22/17	77/75
Hematocrit(%)	39.07/39.64	35 ^a /35 ^a	4.52/4.11	27.70/30	51/50.70
Weight(kg)	71.69/72.41	80/70	12.11/12.05	41/38	100/120
Surgery time(Min)	54.72/52.14	30/30 ^a	37.38/28.51	12/14	215/180
Post-anaesthesia care unit stay.(Min)	56.71/53.73	60/60	13.74/15.39	30/30	85/90
Crystalloid fluids. i.v.(ml)	1161/1136	-	280.17/189.07	600/600	2500/1500
Fast Track criteria	11.28/11.47	10/14	1.408/1.94	8/7	14/14
Post Anaesthesia Discharge score	8.49/9.29	8/10	.527/.931	8/8	10/10

Table-2: Anaesthetic induction and recovery patterns

	Mean	STD. Error of Mean	SD	Mode	N/Percent
Induction					
Group A / B					
To loss of consciousness (Min)	1.27/1.1	.068/.032	.62/.29	1/1	-
To completion of intubation (Min)	4.82/4.4	.15/.107	1.44/.97	4/4.0	-
Unexpected movement at intubation(n-%)	-	-	-	-	3n-3.6%/4n-4.8%
Cough at intubation (n-%)	-	-	-	-	0 / 1n-1.2%
Smooth induction(n-%)	-	-	-	-	80n-95.2%/77n-92.8%
Unexpected movement & cough at intubation (n-%)	2.91 (both groups)	-	.416 (both groups)	-	0 / 1-1.2%
Recovery					
Group A / B					
Awakening(Min)	8.77/10.54	.670/.861	6.10/7.84	5/5	
Time to give reversal after stopping anaesthesia(Min)	3.75/3.8	.310/.358	2.83/3.2	2/1.0	-
Extubation time after neostigmine(Min)	3.077/4.7	.241/.344	2.19/3.1	2 ^a /5	-
Orientation Time to full consciousness from stopping anaesthesia(Min)	15.12/15.82	1.07/.962	9.80/8.7	10.00/10	-
Extubation time from stopping anaesthesia(Min)	7.37/7.6	.452/.528	4.12/4.8	4/6	-

a: Multiple modes exist, smallest one is shown.

Table 3: American Society of Anaesthesiologist classification.

ASA Classes	Frequency	Percent
(Group A / B)		
Class-I	37/38	44/45.8
Class-II	14/13	16.7/15.7
Class-III	14/14	16.7/16.9
Class-IV	18/18	21.4/21.7

In our study inhalation induction(group-A) was slightly slower as compared to intravenous induction with propofol (group-B) but a higher incidence of unexpected movement/cough was noted during propofol induction as compared to sevoflurane(Table 2). ASA physical status classes of both groups were identical (Table 3).¹³ Labetalol was used in majority of patients for blood pressure management (Table 4). Though different anaesthesia techniques were used in both groups while standardizing anaesthetic maintenance factors and per-operative medications, we noted no clinical superiority in recovery times in

ambulatory laparoscopic cholecystectomy. The value of correlation co-efficient(r) was .372 and .556 respectively in both groups and significant at 0.01 level(2-tailed)(Table 5).

Table 4: Adjunct medications

		Group-A	Group-B
		(n / %)	
Labetalol(used for blood pressure control)		37/44.57	27/32.53
Phenylephrine(to improve low blood pressure)	Used	13/15.66	14/16.86
	Not used	70/84.33	69/83.13
Lidocaine(To blunt laryngoscopic response)	Used	41/41.39	30/36.15
	Not used	42/50.60	53/63.85
Atropine(bradycardia)	Used	5/6.02	9/10.84
	Not used	78/93.97	74/89.15
Inj.Transamine(prophylactic)		12/14.45	10/12.04

Table 5: Spearman's Rank Correlation

		Fast track criteria (Group)A/B	Post anaesthesia discharge score (Group)A/B
Fast track criteria	Pearson Correlation	1	.372**/.556**
	Sig.(2-tailed)		.001
	N	83	83
Post anaesthesia discharge score	Pearson Correlation	.372**/.556*	1
	Sig.(2-tailed)	.001	
	N	83	83

**Correlation is significant at the 0.01 level (2-tailed).

Discussion

The gallstone disease has incidence of 12% in US population and about one million people being diagnosed annually in rest of the world each year.¹⁴The safe anaesthesia and prompt recovery is key element and this practice has been facilitated by the introduction of short acting anaesthetic agents like propofol,sevoflurane and desflurane^{15,16}. Agents used in our study i.e propofol and sevoflurane provide rapid and smooth induction and maintenance as well as shorter recovery as shown in various studies.^{6,15-18} Dexamethasone is a potent corticosteroid which reduces severity of post-operative nausea,vomiting, pain and fatigue while laparoscopic procedures have marked metabolic and hormonal effects and may hinder clinical recovery from anaesthesia.¹⁹ A study by Tuvayanon W and colleagues stated that issues like per-operative anxiety and causes of abdominal distension like gastric distension at time of apnoea ventilation and carbon dioxide gas pressure during

procedure are important factors affecting recovery and need to be taken care of.²⁰ In our study all patients were advised sedative to allay anxiety night before procedure and also carbon dioxide gas pressure was kept at or below 10cmH₂O, while at end of surgical procedure instrument were removed from port site to allow release of carbon dioxide gas to atmosphere to minimize abdominal distension. Some amount of carbon dioxide gas may remain inside after laparoscopic surgery causing feeling of abdominal distension with absorption in next 24-48 hours as this may cause shallow breathing and decreases ability to expel carbon dioxide gas by breathing.²¹ A study by Brent B and Mark K concluded that clinical SPEEDS criteria was as specific and more sensitive in determining phase-I nursing intervention for ambulatory surgery cases when compared to fast track criteria^{5,6} and modified Aldrete score.^{5-7,22} In study done by Maqbool MS and colleagues in evaluation of recovery pattern in post operative patient care after surgical anaesthesia stated that scoring system i.e fast track criteria and modified Aldrete score offers guidance and are helpful in optimizing management so as to decrease morbidity.²³ Jain A and colleagues in their study concluded that scoring based recovery evaluation criteria had a lower significance value than the traditional time based discharge method.²⁴ Total intravenous anaesthesia is better as compared to sevoflurane, primary factors that inhibited fast tracking included pain, post-operative nausea and vomiting and desaturation in particular.²⁵ Among the various anaesthetic regimen in use for day case laparoscopic cholecystectomy no randomized controlled trial exists depicting the superiority of any specific anaesthetic technique as concluded by Vaughan J and colleagues in their study.²⁶ Multimodal anaesthetic and analgesic anaesthetic approach is highly feasible in laparoscopic cholecystectomy while pain and post-operative nausea and vomiting are main factors complicating recovery, whereas transient oxygen desaturation noted in post-anaesthesia care unit may postpone discharge but its clinical importance is questionable.²⁷ One study by Ghatge S²⁸ and colleagues stated that sevoflurane anaesthetic induction is faster and its use as maintenance agent reduces need for opioid analgesics which in turn limits nausea and vomiting and suitable for day case surgeries.²⁸ Various studies showed no significant superiority existed in both

intravenous(propofol) and inhalational(sevoflurane) induction techniques.

Conclusion

1. Use of anaesthesia discharge scoring system can ensure safe recovery along with clinical assessment of patient's physiological status
2. Inhalation induction(group-A) was slightly slower as compared to intravenous induction with propofol (group-B) but a higher incidence of un-expected movement/cough was noted during propofol induction as compared to sevoflurane.
3. Though different anaesthesia techniques were used in both groups while standardizing anaesthetic maintenance factors and per-operative medications, no clinical superiority was noted, in recovery times, in ambulatory laparoscopic cholecystectomy.

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Key for Contribution of Authors : A= Conception/ Study/ Designing /Planning; B= Experimentation/Study conduction; C=Analysis/Interpretation/ Discussion; D= Manuscript writing; E= Critical review; F= Facilitated for reagents/Material/Analysis