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Regional Anesthesia versus General Anesthesia in Laproscopic Cholecystectomy (With Low Pressure Pneumoperitoneum) - A Comparative Evaluation

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ABSTRACT

OBJECTIVE- To provide safe intraoperative anaesthetic conditions for surgery, to provide better post operative analgesia and to observe low incidence of intra and postoperative complications in SA compare to GA.

METHOD- This study was conducted on 60 cases in the Department of Anaesthesiology, NIMS MEDICAL COLLEGE JAIPUR after obtaining approval from hospital ethical committee. Both male and female patients ranging between the age group 18 to 70 years belonging to ASA I or II grades, undergoing Laproscopic cholecystectomy surgery were included in study.Patients with cardiac diseases,with obstructive pulmonary disease and patients who were contraindicated for spinal anesthesia were excluded.

RESULT-Between both groups, when changes in pulse readings were observed intra-operatively, at 10, 15, 20, 25, 30 & 45 minutes respectively, the mean pulse among patients in group A statistically significantly differed from that of patients of group B (p value<0.05) whereas at baseline, at 5 minutes & at the end of 2 hours, no statistically significant difference was observed between 2 groups (z-test) (p value>0.05).

CONCLUSION-Spinal anesthesia is adequate, safe, and cost effective for laparoscopic cholecystectomy with low pressure pneumoperitoneum in otherwise healthy patients and offers better postoperative pain control than general anesthesia without limiting recovery.

I. INTRODUCTION

Cholecystectomy by Laparoscopic method is an advancement; if it is performed under regional anaesthesia (with low pressure pneumoperitoneum), the combination makes procedure a perfect preferment for patient comfort. Laparoscopic cholecystectomy (LC) is conventionally performed under general anaesthesia (GA) to prevent aspiration, abdominal discomfort and hypercarbia which was expected secondary to induction of CO_2 pneumoperitoneum. Regional anaesthesia techniques have been used for performing LC as an alternative to GA. It has been used as a routine technique for otherwise healthy patients. Spinal anaesthesia (SA) is commonly used anaesthetic technique that has a very good safety profile.

In 1985, Prof Dr Erich Mühe of Germany performed the first laparoscopic cholecystectomy (LC)[1]. He performed 94 such procedures before another surgeon, Phillipe Mouret of Lyon, France, performed his first laparoscopic cholecystectomy in 1987 [2], who said: “Laparoscopy is the only method capable of performing a complete and valid surgical exploration of the abdomen, with the peritoneal cavity in nearly physiological conditions, except for the elevation of the anterior abdominal wall.” In 1988, the authors reported using this technique on 36 patients[2]. A gynecologist, William Saye, collaborated with general surgeon Barry McKernan to perform the first laparoscopic cholecystectomy in the United States [3].Reddick and Olsen described their initial series of 25 patients in whom laser laparoscopic techniques were used to remove the gallbladder [4]. Several studies published in series, results supported decreased morbidity and reduction in hospitalization when compared to the traditional method for cholecystectomy. In 1990, his group performed the first laparoscopic under general anesthesia lasting more than four hours.Until recently the choice of anesthetic technique for upper abdominal laparoscopic surgery is mostly limited to general anesthesia with muscle paralysis,

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tracheal intubation and intermittent positive pressure ventilation (IPPV). At induction of anesthesia it is important to avoid stomach inflation during ventilation as this increases the risk of gastric injury during trocar insertion. Tracheal intubation and IPPV ensure airway protection and control of pulmonary ventilation to maintain normocarbia. Ventilation with a large tidal volume of 12-15 mL/kg prevents progressive alveolar atelectasis and hypoxemia and allows for more effective alveolar ventilation and carbon dioxide elimination [5].

Epidural anaesthesia has been used for outpatient gynaecological laparoscopic procedures to reduce complications and shorten recovery time after anesthesia. Local or regional anesthetic techniques have not been reported for laparoscopic cholecystectomy or other upper abdominal surgical procedures except in patients with cystic fibrosis. A high epidural block (T2-T4 levels) is required to abolish the discomfort of surgical stimulation of the upper gastrointestinal structures. The high block produces myocardial depression and reduction in venous return, aggravating the hemodynamic effects of tension pneumoperitoneum.Many researchers have observed that performing laparoscopic surgery under regional analgesia carries many advantages.Avoidance of airway instrumentation and lower incidence of deep vein thrombosis are other important advantages of this technique. Spinal anesthesia has the advantage of providing analgesia and muscle relaxation with complete preservation of consciousness and rapid postoperative recovery. In addition, there is a protection against the potential complications of general anesthesia.

In general, laparoscopic procedures of the abdominal cavity necessitate endotracheal intubation and mechanical ventilation due to the induction of pneumoperitoneum. The increased intra-abdominal pressure together with the increased carbon dioxide load to the lungs are considered as better managed under mechanical ventilation, thus making general anesthesia a necessary requirement for these operations. In the past decade, a small number of reports appeared involving regional anesthesia for laparoscopic general surgery, including patients with coexisting pulmonary disease who were deemed high risk for general anesthesia. More recently, a limited number of studies showed the feasibility of the application of regional anesthesia on healthy subjects.

II. MATERIALS & METHOD-

This study was conducted on 60 cases in the Department of Anaesthesiology, NIMS MEDICAL COLLEGE JAIPUR after obtaining approval from hospital ethical committee. Both male and female patients ranging between the age group 18 to 70 years belonging to ASA I or II grades, undergoing Laproscopic cholecystectomy surgery were included in study. They were randomized into 2 groups of 30 patients each and an effort was made that the groups do not significantly differ with respect to age, weight and height.Patients with cardiac diseases,with obstructive pulmonary disease ,suspected and confirmed common bile duct stones and contraindications for spinal anesthesia were excluded.60 patients were divided into 2 groups of 30 each. Group I : Spinal Anaesthesia Group and Group II : General Anaesthesia Group.

In the group I the patient was placed in sitting or left lateral decubitus position as deemed comfortable. The subarachnoid space puncture was performed between the L_3-L_4 apophyses and 0.3 mg/kg of hyperbaric 0.5% bupivacaine plus Fentanyl 25mcg was injected. Afterwards patient was placed in the supine position with a 15 degree head down position. As soon as sensory block level reached at T4 dermatome; surgery could be started.In group II anaesthesia was induced with Fentanyl 2mcg/kg, Propofol 2.5 mg/kg and Scoline 2mg/kg. Patient was ventilated with O2 underfacemask then Laryngoscopy and intubation was done with appropriate sized endotracheal tube. Maintenance of anaesthesia was done with O_2, N_2O, Halothane and Vecuronium. Residual neuromuscular blockage was antagonized with 2.5 mg of neostigmine and 0.4 mg of glycopyrrollate at the end of the surgery.

INTRAOPERATIVE HEMODYNAMIC CHANGES -TABLE - 1
COMPARATIVE ANALYSIS OF PULSE AMONG SA & GA GROUPS

S. No.	Time points	N	Mean	SD	p-value
1.	SA(T_1=0 sec) GA(T_1=0 sec)	N_1= 30 N_2=30	93.30 94.93	13.14 14.42	0.649
2.	SA(T_2=5 min)	N_1= 30	95.63	13.83	0.243

	GA(T_2=5 min)	N_2=30	100.47	15.87	
3.	SA(T_3=10 min) GA(T_3=10 min)	N_1= 30 N_2=30	95.87 98.57	15.63 16.25	0.010*
4.	SA(T_4=15 min) GA(T_4=15 min)	N_1= 30 N_2=30	90.10 94.87	14.79 14.58	0.014*
5.	SA(T_5=20 min) GA(T_5=20 min)	N_1= 30 N_2=30	86.80 97.47	14.06 13.06	0.003*
6.	SA(T_6=25 min) GA(T_6=25 min)	N_1= 30 N_2=30	82.47 96.43	12.94 15.92	0.000*
7.	SA(T_7=30 min) GA(T_7=30 min)	N_1= 30 N_2=30	84.90 94.93	12.03 13.38	0.003*
8.	SA(T_8=45 min) GA(T_8=45 min)	N_1= 30 N_2=30	73.93 92.17	31.48 22.27	0.012*
9.	SA(T_9=60 min) GA(T_9=60 min)	N_1= 30 N_2=30	$74.53^{\#}$ 70.47	41.38 45.37	0.927

Between both groups, when changes in pulse readings were observed intra-operatively, at 10, 15, 20, 25, 30 & 45 minutes respectively, the mean pulse among patients in group A statistically significantly differed from that of patients of group B (p value<0.05) whereas at baseline, at 5 minutes & at the end of 2 hours, no statistically significant difference was observed between 2 groups (z-test) (p value>0.

TABLE-2 COMPARATIVE ANALYSIS OF SBP AMONG SA & GA GROUPS

S. No.	Time points	N	Mean	SD	p-value
1.	SA(T_1=0 sec) GA(T_1=0 sec)	N_1= 30 N_2=30	131.03 127.23	16.40 14.27	0.342
2.	SA(T_2=5 min) GA(T_2=5 min)	N_1= 30 N_2=30	122.86 133.83	19.50 16.40	0.022*
3.	SA(T_3=10 min) GA(T_3=10 min)	N_1= 30 N_2=30	115.57 130.43	18.39 17.58	0.002*
4.	SA(T_4=15 min) GA(T_4=15 min)	N_1= 30 N_2=30	112.83 125.2	17.25 17.14	0.007*
5.	SA(T_5=20 min) GA(T_5=20 min)	N_1= 30 N_2=30	111.37 127.5	15.34 17.18	0.000*
6.	SA(T_6=25 min) GA(T_6=25 min)	N_1= 30 N_2=30	111.83 130.53	13.50 17.31	0.000*
7.	SA(T_7=30 min) GA(T_7=30 min)	N_1= 30 N_2=30	115.87 126.57	10.78 14.72	0.002*
8.	SA(T_8=45 min) GA(T_8=45 min)	N_1= 30 N_2=30	116.53 127.73	10.89 12.89	0.004*
9.	SA(T_9=60 min) GA(T_9=60 min)	N_1= 30 N_2=30	116.07 134.76	9.75 10.87	0.000*

While comparing effect of anaesthesia mode on Systolic blood pressure, statistically significant differences were observed between 2 groups (z-test) (p<0.05), except baseline observation only (p>0.05).

TABLE-3
COMPARISON OF POST OPERATIVE VAS SCORE BETWEEN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY UNDER SA VS GA

Time points	SA group (N_1=30)	GA group (N_2=30)	P value
T0 (0 min post op)	1.0±0.4	6.1±1.1	0.0001*
T2 (2 hr post op)	2.0±0.6	5.5±0.8	0.04*
T6 (6hr post op)	2.8±0.4	5.4±0.67	0.0023*
T12 (12 hr post op)	2.4±0.3	5.1±0.3	0.03*

T18 (18hr post op)	2.0±0.5	4.2±0.86	0.01*
T24 (24hr post op)	1.0±0.2	4.0±0.65	0.002*

As it is shown in table, the VAS score has lower mean values in SA group when compared with GA group, also the differences between the mean VAS score in 2 groups at different post operative time points was found to be statistically significant to highly significant (z-test) ($p<0.05$ to $p<0.001$).

TABLE-4
COMPARISON OF COMPLICATIONS BETWEEN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY UNDER SA VS GA

Complication	SA Group		GA Group	
	No.	%	No.	%
Urinary retention	5	55.56	3	21.43
Postural headache	2	22.22	0	00.00
Back pain	1	11.11	0	00.00
Post operative nausea vomiting	1	11.11	7	50.00
Sore throat	0	00.00	4	28.57
Total	9	100.00	14	100.00

{χ^2=17.052, df=4, p=0.002}

Table 4 shows that among 30 patients undergoing surgery under SA, 9 (30.0%) observed one or the other complications whereas among 30 patients undergoing surgery under GA, 14 (46.67%) experienced one or the other complications which is higher than first group. In SA group, most common complication occurring was urinary retention followed by postural headache, PONV and back pain respectively. In GA group most common complication was PONV followed by sore throat and urinary retention respectively.Also whenχ^2 test was applied to assess statistical difference between occurrence of complication between 2 groups, it was observed to be statistically significant. (p<<0.05).

Table-5
COMPARISON OF HYPOTENSION, BRADYCARDIA& SHOULDER EVENT OCCURRENCE BETWEEN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY UNDER SA VS GA

Event occurrence	SA Group (N_1=30)		GA Group (N_2=30)	
	No.	%	No.	%
Hypotension	7	36.84	2	66.67
Bradycardia	2	10.53	1	33.33
Right shoulder pain	10	52.63	0	00.00
Total	19	100.00	3	100.00

{χ^2=3.131, df=2, p=0.209}

In SA group the event occurrence was lower as compared to GA group in terms of hypotension,bradycardiabut right shoulder pain was experienced by majority of SA group (52.63%)patients. Though when χ^2 test was applied to assess statistical difference related to occurrence of these events between 2 groups, it was observed to be statistically insignificant. (p>0.05)

III. DISCUSSION

The anaesthesiologist's traditional approach to anaesthesia for laparoscopic cholecystectomy has been the emphasis on maintaining haemodynamic stability by avoiding hypertension, hypotension or tachycardia. Laparoscopic cholecystectomy is usually performed under general anesthesia with tracheal intubation to avoid aspiration and respiratory complications secondary to the induction of pneumoperitoneum. Recently, it has been shown that laparoscopic cholecystectomy can be done successfully under spinal anesthesia in healthy patients.

Yuksek YN[19] in their study reported that none of the patients had cardiopulmonary problems other than transient hypotension during surgery.Purvi J. Mehta[23]found in their study that there is less tachycardia and less rise in blood pressure in patients receiving spinal anaesthesia compared to general anaesthesia

.Ellakany M[32]observed that systolic and diastolic blood pressure showed significant decrease in the early-operative in group SA, when compared to group GA. The heart rate showed significant decrease in group SA when compared to group GA throughout the time of measurements during surgery and immediate postoperative period.Above mentioned previous studies suggest that there is more haemodynamic stability in SA group as compared to GA group, this correlates with our study.Sinha et al[21]reported intraoperative right-shoulder pain in 12.3%patients but none of them required conversion to GA.

We also had our observations similar to above studies but none of the patient required conversion to GA.Purvi J. Mehta[23]found that the postoperative complications, nausea, vomiting and dizziness were more common with general anesthesia due to intubation of trachea and intravenous drugs.We agree with the studies[23,28,30,35,40] that there were greater incidences of postoperative complicationsafter general anaesthesia as compared with spinal anaesthesia.

IV. CONCLUSION-

We can conclude that spinal anesthesia is adequate, safe, and cost effective for laparoscopic cholecystectomy with low pressure pneumoperitoneum in otherwise healthy patients and offers better postoperative pain control than general anesthesia without limiting recovery.

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