IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 12 Ser.4 (December. 2022), PP 41-46
www.iosrjournals.org

Spinal Anaesthesia vs General Anaesthesia for Laparoscopic Cholecystectomy: A study in a tertiary care hospital

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Abstract

Laparoscopic cholecystectomy is considered the "gold standard" for the surgical treatment of gallstone disease. This procedure results in less postoperative pain, better cosmesis, and shorter hospital stays and disability from work than open cholecystectomy. Laparoscopic cholecystectomy is considered the "gold standard" for the surgical treatment of gallstone disease. This procedure results in less postoperative pain, better cosmesis, and shorter hospital stays and disability from work than open cholecystectomy. A comparative clinical study was conducted in the department of Anesthesia, Sylhet M.A.G. Osmani Medical College and Hospital, Bangladesh during the period from January 2020 to December 2020. Our study aimed to compare Spinal Anesthesia and General Anesthesia for laparoscopic cholecystectomy in healthy patients. A total of 60 patients aged between 18-65 years of both sex with ASA Grade status I and II undergoing elective laparoscopic Cholecystectomy is selected. After taking written informed consent from the study participants, we elected 160 study subjects and divided them into two groups; Group I (n=40) received General Anesthesia. And Group II (n=40) received spinal Anesthesia. The male and female ratio was 1: 1.96. The study adopted an exclusion criterion which was the patients with ASA grade III and IV high-risk patients, all emergency procedures, bleeding disorders, acute cholecystitis, pancreatitis and acute cholangitis, previous open surgery in the upper abdomen, contraindications for pneumoperitoneum, cardiovascular disorders, respiratory disorders, renal disease and liver disease, circulatory instability, and patients with known sensitivity to local anesthetics. The procedures are completed by the allocated method of anesthesia, as there were no conversions from spinal to general anesthesia. The pain was significantly less at 4 hours, 8 hours, 12 hours, and 24 hours after the procedure for the Spinal Anesthesia group, compared with those who received General Anesthesia. There was no difference between the two groups regarding complications, hospital stay, recovery, or degree of satisfaction at follow-up. In the conclusion, we can say, Spinal Anesthesia provides better safety and adequacy in healthy patients and provides better postoperative pain control without limiting the recovery than General Anesthesia. Post-operative complications like nausea, vomiting, dizziness and pneumonia are less in Spinal Anesthesia.

Keywords: *Spinal Anesthesia, Surgical Treatment, General Anesthesia, Laparoscopic Cholecystectomy.*

Date of Submission: 02-12-2022 Date of Acceptance: 14-12-2022

I. Introduction

It is surprising that regional anaesthesia has been successfully used for laparoscopic cholecystectomy in patients unfit to have the procedure under General Anesthesia but has not been tested in healthy patients in whom any presumed risk would be theoretically much lower. Hamad and Ibrahim El-Khattary used spinal anaesthesia for laparoscopic cholecystectomy for the first time in a small series of healthy patients but they used nitrous oxide as a pneumoperitoneum instead of standard carbon dioxide. Recently, it has been shown that laparoscopic cholecystectomy can be done successfully using carbon dioxide pneumoperitoneum under Spinal Anesthesia in healthy patients with symptomatic gallstone disease [1]. Laparoscopic cholecystectomy has

become very popular after it was first described in 1987 by Philippe Mouret in France. Laparoscopic surgical techniques have been rapidly accepted by surgeons worldwide with published reports describing the benefit of less postoperative pain, decreased hospital stay and earlier return to work [2]. Minimally invasive therapy is done with the general aim to minimize the trauma of the interventional process whilst still achieving a satisfactory result.3 Johnson4 noted that "all laparoscopic procedures are merely a change in access and still require General Anesthetic; hence the difference from conventional surgery is likely to be small." This statement is predominantly based on the assumption that laparoscopy necessitates endotracheal intubation to prevent aspiration and respiratory embarrassment secondary to the induction of carbon dioxide pneumoperitoneum, which is not well tolerated in a patient who is awake during the procedure [5,6]. The incidence of postoperative morbidities like nausea, vomiting, dizziness, respiratory complication, thromboembolism and pneumonia was much less as compared to General Anesthesia [7]. Also, the total cost of Spinal Anesthesia concerning hospital stay, induction and recovery, the need for postoperative antiemetics and analgesia and the incidence of other complication was much lower when compared to General Anesthesia [8]. This study was planned to assess the comparative superiority of Spinal Anaesthesia with General Anaesthesia for elective laparoscopic Cholecystectomy in healthy patients.

II. Objectives

General Objective:

To compare between Spinal Anaesthesia and General Anaesthesia for laparoscopic cholecystectomy in healthy patients in a tertiary hospital, Bangladesh

Specific Objective:

To know more about the risk and benefit of laparoscopic cholecystectomy procedure in Bangladesh

III. Materials and Methods

A comparative clinical study was conducted in the department of Anesthesia, Sylhet M.A.G. Osmani Medical College and Hospital, Bangladesh during the period from January 2020 to December 2020. Our study aimed to compare Spinal Anaesthesia and General Anaesthesia for laparoscopic cholecystectomy in healthy patients. A total of 160 patients aged between 18-65 years of both sex with ASA Grade status I and II undergoing elective laparoscopic Cholecystectomy were selected for the study. After taking written informed consent from the study participants, we elected 160 study subjects and divided them into two groups; Group I (n=40) received General Anaesthesia. And Group II (n=40) received Spinal Anaesthesia. After taking approval, an elective laparoscopic Cholecystectomy procedure was taken. After taking the patients to the operation theatre, an intravenous line was secured in the right upper limb and an infusion of 500 ml of Ringer's Lactate solution started. A blood pressure cuff, ECG electrode and capnography monitor were applied. The initial pulse, blood pressure (BP), respiratory rate, ECG and end-tidal CO2 (EtCO2) were noted. All the patients were premeditated with Inj. Glycopyrrolate 4 mcg/kg, Inj. Midazolam 0.02 mg/kg and Inj. Ondansetron 0.08 mg/kg intravenously (i.v.). In patients randomized for Spinal Anesthesia, the patient was first made to lie in the supine position and all the monitors were attached. Oxygen was then administered through a venturi mask at 3 l/minute. Then the patient was made to lie in the left lateral decubitus position. A 25-G Quincke spinal needle was introduced in the subarachnoid space at L3-L4 interspace under all aseptic and antiseptic precautions. After confirming the free flow of cerebrospinal fluid, 0.3 mg/kg of hyperbaric Bupivacaine 0.5% was injected intrathecally in the cephalad direction. Then, after keeping the patient in the 15o Trendelenburg position for 5 minutes, the patient was again made to lie in a supine position. Approximately 10 minutes after intrathecal injection, the level of analgesia was checked. During this period, 500 ml of 0.9% Ringer's Lactate was infused. A segmental sensory (pin-prick) block, extending between T4 and L5 dermatomes, was obtained without any respiratory distress. Laparoscopic cholecystectomy was performed using the same techniques in both groups with a standard for trocar insertion. After painting and draping, Inj. Bupivacaine plain (0.2%) 10 ml was injected sub-coastally under the diaphragm equally on both sides in both groups. Pneumoperitoneum was established by using the open (Hasson) technique with carbon dioxide at maximum intra-abdominal pressure of 12 mm Hg. Intraoperatively, the patients randomly allocated to the general anesthesia group received fentanyl citrate 2 μg/kg i.v. as an adjuvant while those allocated to the spinal anesthesia group were given 25 μg i.v. as a bolus and when required. All the patients were monitored continuously both for clinical observation and noninvasive hemodynamic monitoring like electrocardiography, pulse, blood pressure, respiratory rate, pulse oximetry and EtCO2 which were recorded at 15-minute intervals. Operative times as well as any intraoperative events such as shoulder pain, headache, nausea, and discomfort were recorded. Postoperative pain was assessed at 4, 8, 12 and 24 hours by using the Visual Analogue Scale (VAS) after completion of the procedure. Other postoperative events either related to surgical or especially to the anesthetic procedure, such as discomfort, nausea and vomiting, shoulder pain, urinary retention, pruritus, headache and another neurological sequel, were recorded.

IV. Results

All the procedures were completed within the allocated method of anesthesia and there was no conversion of spinal to general anesthesia. Intra-operatively, there was no bradycardia in either group. In Group-II, hypotension (i.e. >30% fall in BP) was noted in 12 (30%) cases, out of which me phentermine 6 mg was given in only 2 cases and the rest were managed with i.v. fluids, while in Group-I, hypotension was noted in 4(10%) cases and all of them were managed with i.v. fluids. Pain/discomfort in right shoulder was noted in 9 (22.5%) cases but it was severe enough in only 4 (10%) cases which received i.v. fentanyl 25 µg bolus once. Rests were managed with massage over right shoulder. The remaining patients did not require any additional medication or other intervention, and procedures were completed uneventfully in all cases. Intraoperative comparison of mean pulse rate in Group-I and Group-II showed less tachycardia. Figure shows that mean systolic and diastolic pressure, respectively, in both the groups, which were found to be higher in Group-I compared to Group-II. In Group-I, to maintain the EtCO2 in between 35- and 40-mm Hg, respiratory rate has to be increased, while in Group-II, in spontaneously ventilated patients of Spinal Anesthesia, the increase in respiratory rate was similar to that of Group-I. This shows that there was no pain or respiratory distress in Group-II. Study shows that the mean EtCO2 in both the groups initially increased after peritoneal insufflations and then gradually returned to baseline values after several minutes. Hence, EtCO2 readings in both the groups were similar. Mean discharge from the hospital in Group-I was 48.33 hours and in Group-II it was 36.53 hours. There was no mortality or morbidity in either group. Regarding the postoperative complications, nausea was present in 12 (30%) cases in Group-I while none had it in Group-II. Dizziness was there in 8 (20%) cases in Group-I while none had it in Group-II. Pruritus was there in 5 (12.5%) cases in Group-I and 3 (7.5%) cases in Group-II. Pain at local site was noted in 26 (65%) cases in Group-I and in only 5 (12.5%) cases in Group-II. There was no headache, backache, urinary retention or any other major complication. At the time of discharge, all patients were asked about the satisfaction regarding the general as well as spinal anesthesia and the patients were more satisfied with Spinal Anesthesia than General Anesthesia. In the Table II we have shown Mean Pulse Rate, Mean Systolic and Diastolic BP as well as EtCO2 readings of several periods of treatment duration at a glance. From that table we found after in sufflation pulse rate of patients of group I jumped up to 114 which did not so in patients of group II. After starting treatment, the systolic BP raised suddenly up to 135 in group I and stayed for a long time which did not so in group II. About diastolic BP in case of both the anesthesia in both group the DBP found steady but in group II it was some lower. Considering those it can be claimed that Spinal Anaesthesia have some superiority over General Anaesthesia for Laparoscopic Cholecystectomy.

Table 1: Demographic characteristics of the study participants (n=160)

Characteristics of patients	Group- I	Group-II
Male	56	50
Female	24	30
Mean Age in Years	36.67	34.58
Mean Operative Time(minutes)	66.03	66.63
Average Hospital Stay(hours)	48.33	36.53

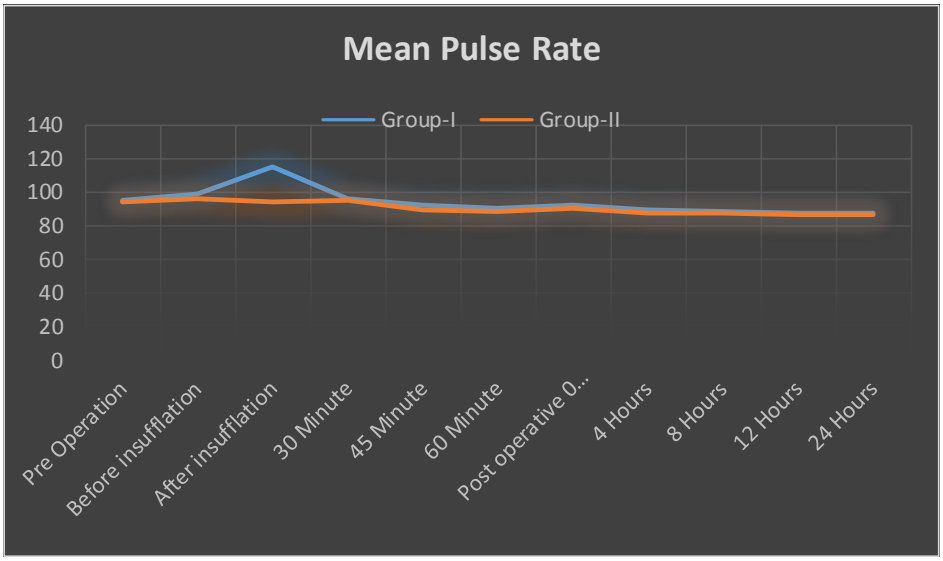

Figure 1: Perioperative comparison of mean pulse rate in Group-I and Group-II

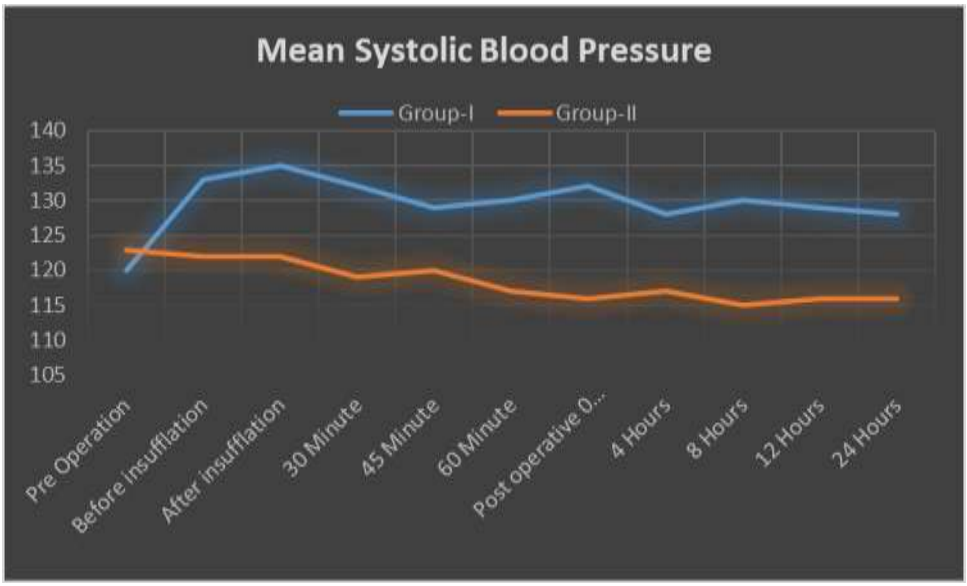

Figure 2: Perioperative comparison of mean systolic blood pressure in Group-I and Group-II

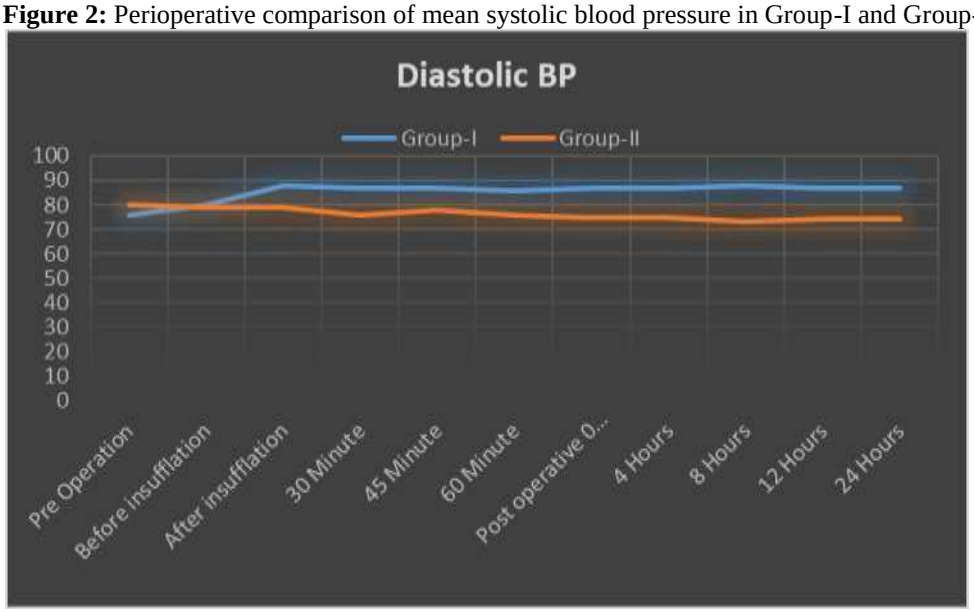

Figure 3: Perioperative comparison of mean diastolic blood pressure in Group-I and Group-II

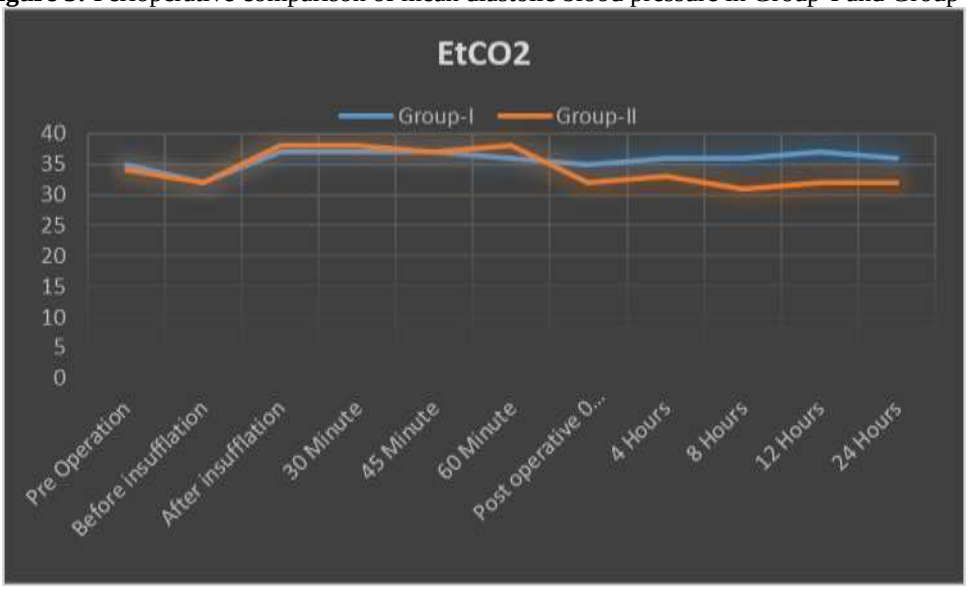

Figure 4: Perioperative Comparison of respiratory rate in Group-I and Group-II

Table 1: At a glance Mean Pulse Rate(MPR), Mean Systolic BP(MSBP), Mean Diastolic BP MDBP & EtCO2 (n=160)

Sub.	Subject	Pre-operation	Before Insufflation	After Insufflation	Aft. 30 min.	Aft. 45 min.	Aft. 60 min.	Post Operative	4 Hrs	8 Hrs	12 Hrs	24 Hrs
MPR	Group 1	86	98	114	96	93	94	95	90	86	82	82
	Group-2	86	88	89	90	91	91	92	88	84	80	80
MSBP	Group 1	120	133	135	132	128	130	132	128	130	129	128
	Group 2	123	122	122	120	121	117	117	116	120	116	116
MDBP	Group 1	75	81	88	87	87	88	86	87	86	87	87
	Group-2	80	80	80	78	79	78	78	76	75	74	73
EtCO2	Group 1	35	32	37	32	32	31	35	36	36	37	36
	Group-2	34	32	38	33	32	33	32	33	31	32	32

V. Discussion

The present study has not only confirmed the feasibility of safely performing laparoscopic cholecystectomy under Spinal Anesthesia as the sole anesthetic procedure but also shown the superiority of Spinal Anesthesia in terms of better postoperative pain control as compared to general anesthesia. Pain assessed throughout any time in the postoperative period during the patient's hospital stay was significantly lesser in spinal Group-Is compared to the General Anaesthesia group, which is due to the residual analgesic effect of local anesthetic in subarachnoid space and decrease in discomfort due to avoidance of general anesthesia [2, 10]. Pain relief, an important component for a rapid and smooth recovery, was seen in the spinal anesthesia group. Intraoperatively, two things were noted - hypotension and pain/discomfort in the right shoulder in the spinal group. Hypotension is due to sympathetic blockade and the mechanical effect of pneumoperitoneum, while pain and discomfort over the right shoulder can be attributed to diaphragmatic irritation from pneumoperitoneum with carbon dioxide. Most of this was managed without drugs, i.e., reassurance to the patient, massage of the right shoulder, keeping the intra-abdominal pressure to 12 mm Hg, avoiding excessive tilting of the table and thereby minimizing diaphragmatic irritation. In our study, diaphragmatic irritation was much less as there was subcostal instillation of Inj. Bupivacaine plain (0.2%) 10 ml each on both sides just before incision. Sometimes, this diaphragmatic irritation is so severe that there may be a conversion of the procedure to General Anesthesia. The use of low-pressure pneumoperitoneum was adequate, especially with the spinal group, as Spinal Anesthesia causes a high level of the motor, sensory and sympathetic blockade and thereby good abdominal muscle relaxation as compared to General Anesthesia. In Group-I, the initial increase in pulse rate and BP after peritoneal insufflations are due to both mechanical and neurohumoral effects [11]. The return of pulse rate and BP to normal baseline was gradual. In Group II, there was little variation in pulse

and BP after peritoneal insufflation as spinal anesthesia tends to decrease the pulse and BP, while the neurohumoral and mechanical effects of pneumoperitoneum tend to increase them. After several minutes, the neurohumoral and mechanical effects are compensated so that there is a slight decrease in the pulse rate and BP. The decrease in pulse rate and BP in Group II as compared to Group-I can be explained as due to a decrease in pain caused by the residual analgesic effect of local an aesthetic in subarachnoid space. Nausea and vomiting are particularly troublesome after laparoscopic surgery; over 50% of patients required antiemetics, so prophylactic antiemetics had been given routinely. Regarding the postoperative complications, nausea, vomiting and dizziness were more common with general anaesthesia due to intubation of the trachea and intravenous drugs. As spinal anesthesia is a regional block, there is less procedure-related cost and hospital stay because of less postoperative pain and complications.

Limitations of the study

This was a clinical study in a single center with small a sample size. So, the study results may not reflect the scenarios of the whole community.

VI. Conclusion and Recommendations

In our study, we observed that in comparison to General Anaesthesia, Spinal Anaesthesia provides better safety and adequacy in healthy patients and hence provides better post-operative pain control without limiting the recovery. Post-operative complications like nausea, vomiting, dizziness and pneumonia are less in Spinal Anaesthesia. Authors are recommending t conduct multi-center study with a large number of sample sizes.

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