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Laparoscopic Cholecystectomy: A Comparison between Spinal Anaesthesia and General Anaesthesia

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Abstract **Original Research Article**

Introduction: Laparoscopic cholecystectomy is the treatment of choice for the surgical removal of diseased gall bladder. It is a negligibly invasive procedure with a considerably shorter hospital stay and an earlier recovery compared with the classical open cholecystectomy. Anesthetic agents offer an alternative to general anesthesia for short-duration surgical procedures, especially ambulatory surgeries. ***Objectives:*** The aim of the study was to compare the effectiveness of spinal anaesthesia with that of general anaesthesia in Laparoscopic Cholecystectomy operation in healthy patient. ***Methods:*** This comparative clinical study was conducted in the Department of Anesthesia, Rajshahi Medical College Hospital, Rajshahi, Bangladesh during the period from January 2020 to December 2020. A total of 60 patients aged between 18-65 years of both sex with ASA Grade status I and II undergoing elective laparoscopic Cholecystectomy were randomly selected for the study and the patients were divided into two groups; Group I(n=30) received general anaesthesia and Group II(n=30) received spinal anaesthesia. Intraoperative parameters, postoperative pain, complications, recovery and cost were compared between both groups. Statistical analysis of the results was obtained by using window-based computer software devised with Statistical Packages for Social Sciences (SPSS-22). ***Results:*** Majority patients were male and mean age was 36.67 in Group I, 34.58 in Group II. Mean Pulse Rate (MPR) of Group I was 86 in pre-operative, 98 before insufflation, and 114 after insufflation. Highest comparison of the mean pulse rate 115 belongs to Group I and lowest mean pulse rate 94 belong to Group II after insufflation. Lowest 122 systolic blood pressure (mean) in Group II and highest 135 systolic blood pressure (mean) in Group I also after insufflation. On the other hand, Perioperative comparison of SpO_2 was lowest 95% and highest 98% of Group I and Group II respectively after 4 hours. ***Conclusion:*** Laparoscopic cholecystectomy can be safely performed under spinal anaesthesia. Spinal anaesthesia was associated with an extremely low level of postoperative pain, better recovery and lower cost than general anaesthesia. Postoperative complications like nausea, vomiting and dizziness were also less in spinal anaesthesia.

Keywords: Anaesthesia; Spinal Anaesthesia; General Anaesthesia; Laparoscopic cholecystectomy.

INTRODUCTION

Laparoscopic cholecystectomy has become the gold standard for the surgical treatment of symptomatic cholelithiasis and has gained worldwide acceptance [1]. It is a negligibly invasive procedure with a considerably shorter hospital stay and an earlier recovery compared with the classical open cholecystectomy [2]. General anesthesia as the most appropriate technique for laparoscopic procedures is a concept of the past. There is rising evidence suggesting that spinal anesthesia has an important role to play in the care of patients undergoing laparoscopic procedures. Laparoscopic cholecystectomy might be related to postoperative pain, nausea and vomiting and is usually done under general anaesthesia. Spinal anesthesia is a commonly used anaesthetic technique that has a very good safety profile and cost effective. Spinal Anaesthesia has several advantages over General Anaesthesia. Single puncture spinal anaesthesia is easier technique than General Anaesthesia. Complications of endotracheal intubation like damage to oral cavity, teeth, sore throat and aspirations, failure of intubation are absent in Spinal Anaesthesia. Cost of Spinal Anaesthesia is far less than General Anaesthesia. Nausea and vomiting are less with Spinal Anaesthesia. Laparoscopic cholecystectomy with low pressure CO_2 pneumoperitoneum under Spinal Anaesthesia is effective in patients who are unfit for General Anaesthesia. Spinal anesthesia has been effectively used for laparoscopic cholecystectomy in

patients unhealthy to have the method under general anesthesia but has not been experienced in healthy patients in whom any recognized danger would be hypothetically much lower. For the anesthetist, it is important to appreciate the advantages and potential risks of the method of anesthesia. Careful choice of the anesthetic technique must be selected for the type of surgery. Merging an inconsequentially invasive surgical procedure with a less invasive anesthetic technique, spinal anesthesia appears to additionally improve the benefit of Laparoscopic cholecystectomy. Although the mentioned advantage, the use of spinal anesthesia for Laparoscopic cholecystectomy has still not gained popularity. Lately, few studies have emphasized the viability and security of performing Laparoscopic cholecystectomy under spinal anesthesia. This study determined to compare the perioperative effects between spinal anesthesia and general anesthesia in patients undergoing laparoscopic cholecystectomy.

METHODS

This comparative clinical study was conducted in the Department of Anesthesia, Rajshahi Medical College Hospital, Rajshahi, Bangladesh during the period from January 2020 to December 2020. A total of 60 patients aged between 18-65 years of both sex with ASA Grade status I and II undergoing elective laparoscopic Cholecystectomy were randomly selected for the study and the patients were divided into two groups; Group I (n=30) received general anaesthesia and Group II (n=30) received spinal anaesthesia. Intraoperative parameters, postoperative pain, complications, recovery and cost were compared between both groups. After the patient entered the operation room, the intravenous (I.V.) channel was established and B.P. cuff and pulse oximeter were attached with the patient. Patients randomized for Spinal Anaesthesia the patients were positioned at the right decubitus position and a 25-gauge Quincke spinal needle was introduced into the subarachnoid space at L2-L3 intervertebral space under all aseptic and antiseptic precautions. After free flow of cerebral spinal fluid was obtained, 3 ml (15 mg) of hyperbaric bupivacaine hydrochloride and 25 µg of fentanyl citrate was injected intrathecally. Then the patients were placed in the supine position staying in the 15 degree Trendelenburg position for 5 minutes. 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 the groups with standard for trocar insertion. Ephedrine (10 mg) I.V. was planned to be given in case of hypotension (i.e. <30% fall in BP) and repeated after 5 minutes if it persists. Atropine sulfate (0.5 mg I.V.) was planned to be given in case of bradycardia (HR<50 bpm). In case of shoulder pain, additional fentanyl (1 µg/kg) was planned to be given intravenously. After painting and draping, Inj. Bupivacaine plain (0.2%) 10 ml was injected subcostally under diaphragm equally on both sides in both the groups. Pneumoperitoneum was established by using the open (Hasson) technique with carbon dioxide at maximum intra-abdominal pressure of 12 mm Hg instead of the usual 14 mmHg. All the patients were monitored continuously both for clinical observation and noninvasive hemodynamic monitoring like pulse, blood pressure and oxygen saturation (SpO_2) which were recorded at 15-minute interval. Operative times as well as any intraoperative events such as shoulder pain, headache, nausea, and discomfort were recorded. Postoperative pain was assessed at 0, 1, 4, 8, 12 and 24 hours by using the Visual Analogue Scale (VAS) after completion of procedure. Statistical analysis of the results was obtained by using window-based computer software devised with Statistical Packages for Social Sciences (SPSS-22).

RESULTS

In this study majority patients (70% and 63% in Group I and Group II respectively) were male and mean age was 36.67 in Group I, 34.58 in Group II. Mean operative time (minutes) were 66.03 in Group I, 66.63 in Group II. Average hospital stay was 48.33 hours in Group I and 36.53 hours in Group II. Mean Pulse Rate (MPR) of Group I was 86 in pre-operative, 98 before insufflation, 114 after insufflation, 96 after 30 min., 93 after 45 min., 94 after 60 min., 95 in post-operative, 90 in 4 hrs, 86 in 8 hrs, 82 in 12 hrs, 82 in 24 hrs. Meanwhile, in Group II MPR was 86 in pre-operative, 88 before insufflation, 89 after insufflation, 90 after 30 min., 91 after 45 min., 91 after 60 min., 92 in post-operative, 88 in 4 hrs, 84 in 8 hrs, 80 in 12 hrs, 80 in 24 hrs. Mean Systolic BP(MSBP) was 120 in pre-operative, 133 before insufflation, 135 after insufflation, 132 after 30 min., 128 after 45 min., 130 after 60 min., 132 in post-operative, 128 in 4 hrs, 130 in 8 hrs, 129 in 12 hrs, 128 in 24 hrs. Meanwhile, in Group II MSBP was 123 in pre-operative, 122 before insufflation, 122 after insufflation, 120 after 30 min., 121 after 45 min., 117 after 60 min., 117 in post-operative, 116 in 4 hrs, 120 in 8 hrs, 116 in 12 hrs, 116 in 24 hrs. Mean Diastolic BP (MDBP) was 75 in pre-operative, 81 before insufflation, 88 after insufflation, 87 after 30 min., 87 after 45 min., 88 after 60 min., 86 in post-operative, 87 in 4 hrs, 86 in 8 hrs, 87 in 12 hrs, 87 in 24 hrs. Meanwhile, in Group II MDBP was 80 in pre-operative, 80 before insufflation, 80 after insufflation, 78 after 30 min., 79 after 45 min., 78 after 60 min., 78 in post-operative, 76 in 4 hrs, 75 in 8 hrs, 74 in 12 hrs, 73 in 24 hrs. In Group-I, SpO_2 was 98% in pre-operative, 97% before insufflation, 96% after insufflation, 96% after 30 min., 97% after 45 min., 97% after 60 min., 96% in post-operative 0 min., 95% in 4 hrs, 96% in 8 hrs, 97% in 12 hrs, 98% in 24 hrs. Meanwhile, in Group II SpO_2 was 98% in pre-

operative, 96% before insufflation, 95% after insufflation, 97% after 30 min., 98% after 45 min., 98% after 60 min., 97% in post-operative 0 min., 98% in 4 hrs, 98% in 8 hrs, 98% in 12 hrs, 98% in 24 hrs.

Table-I: Demonstrated the distribution of study patients according to age. (n=60)

Characteristics of patients	Group- I		Group-II	
	n=30	%	n=30	%
Male	21	70.0	19	63.0
Female	9	30.0	11	37.0
Total	30	100.0	30	100.0
Mean age (year)	36.67		34.58	

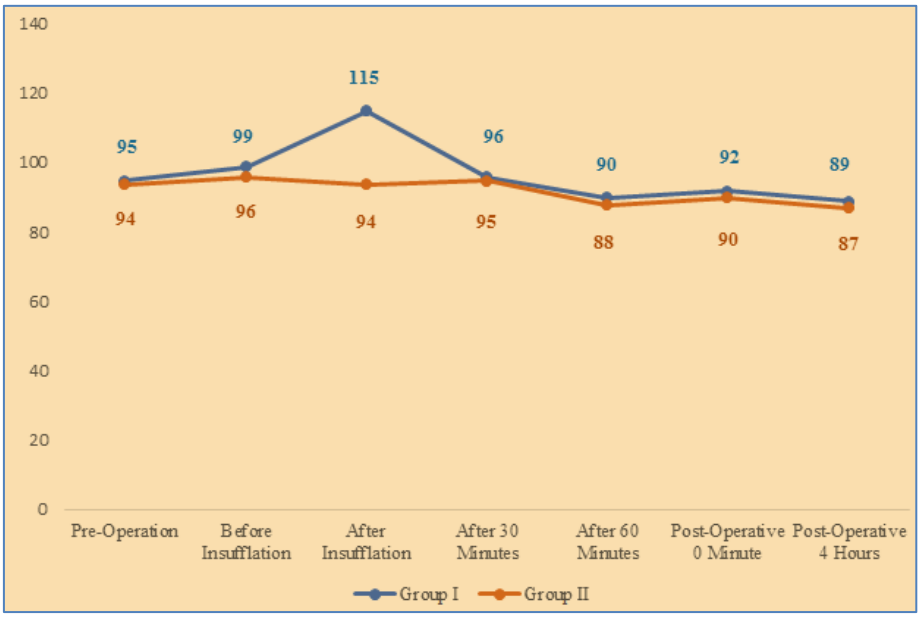

Fig- I: Perioperative comparison of mean pulse rate in Group-I and Group-II

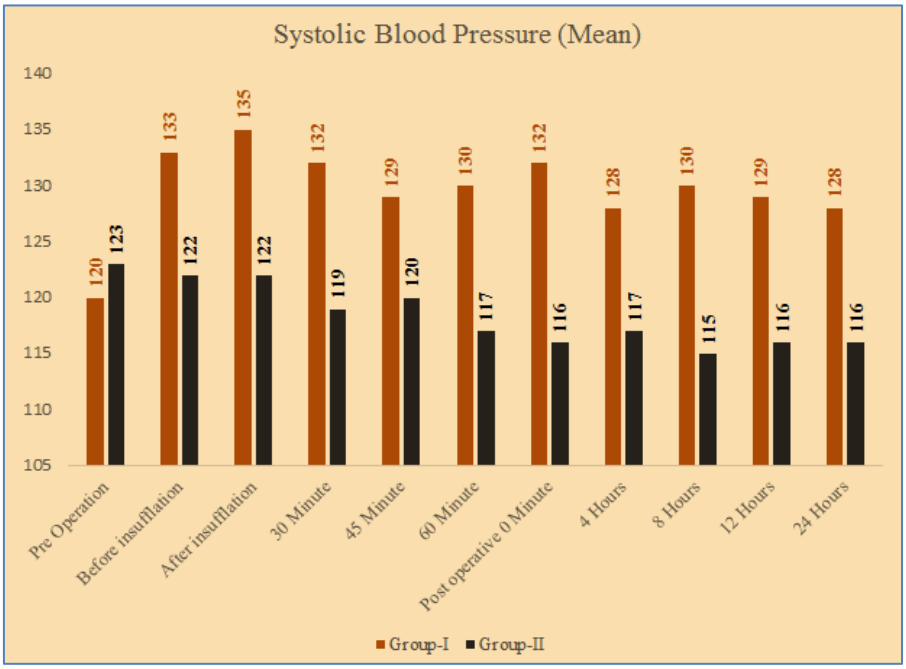

Fig- II: Perioperative comparison of mean systolic blood pressure in Group-I and Group-II

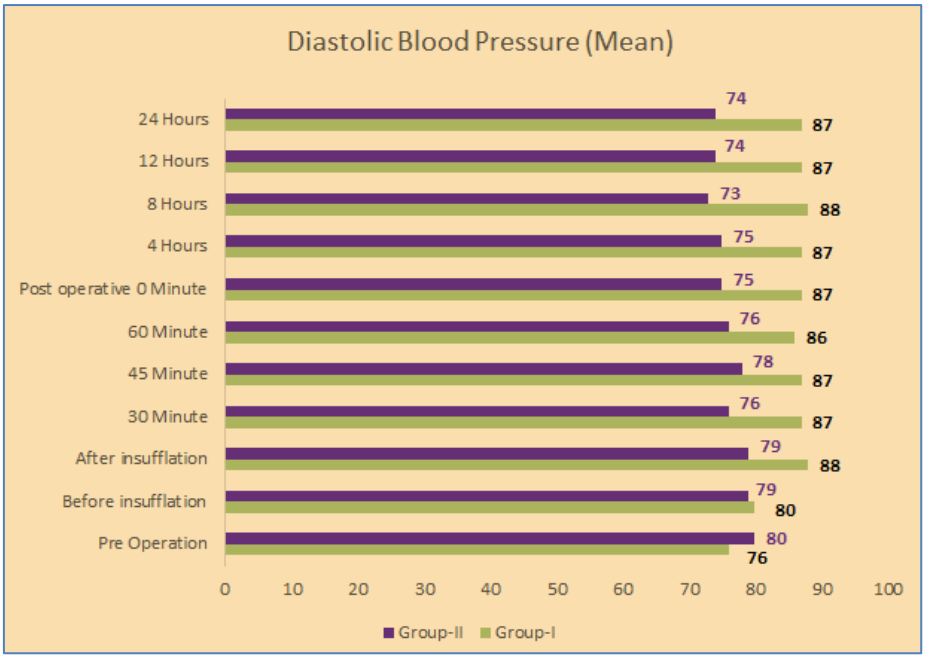

Fig-III: Perioperative comparison of mean diastolic blood pressure in Group-I and Group-II

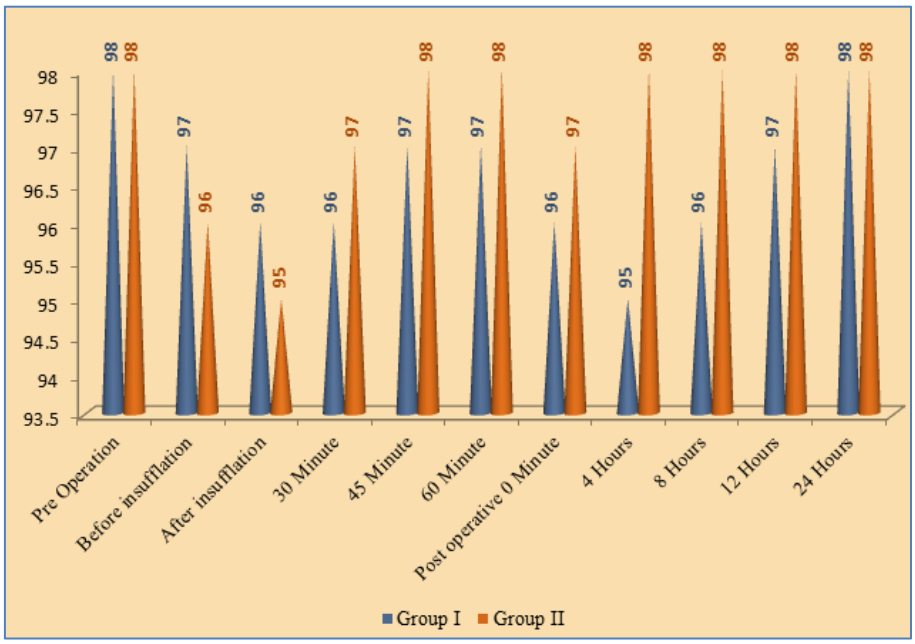

Fig-IV: Perioperative Comparison of SpO_2 In Group-I & Group-II

Table-II: At a glance Mean Pulse Rate (MPR), Mean Systolic BP(MSBP), Mean Diastolic BP (MDBP) Peripheral Arterial Oxygen Saturation (SpO_2).

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
SpO_2	Group 1	98	97	96	96	97	97	96	95	96	97	98
	Group-2	98	96	95	97	98	98	97	98	98	98	98

DISCUSSION

The surgical stress response remains an important feature of the laparoscopic approach, even though it is a less invasive procedure than open cholecystectomy [3-6]. In this study, we tried to compare Spinal Anaesthesia with General Anaesthesia for laparoscopic cholecystectomy in healthy patients. We have not only confirmed the probability of safely performing laparoscopic cholecystectomy under Spinal Anesthesia as the sole anesthetic method in our study, but also presented supremacy of Spinal Anesthesia in terms of enhanced postoperative pain control as associated to general anesthesia. Pain measured during the time in the postoperative period throughout the patients' hospital stay, which was meaningfully slighter in spinal Group I compared to Group II. It might be due to residual pain-relieving consequence of local anesthetic in subarachnoid space and reduction in distress owing to prevention of general anesthesia [7, 8]. In this study, in Group-II, hypotension (i.e. >30% fall in BP) was noted in 30% cases, out of which ephedrine hydrochloride 10 mg was given in only 2 cases and the rest were managed with i.v. fluids, while in Group-I, hypotension was noted in 6.67% cases and all of them were managed with i.v. fluids. Postoperative pain at the local site was observed in 6.67% cases in group-II while it was noted in 66.67% cases in group-I and both were managed by Inj. Fentanyl citrate 25 µg I.V. In group-I, postoperative nausea and vomiting was noted in 20% cases which were managed by Inj. Ondansetron 0.08 mg/kg intravenously (i.v.) while this was completely absent in group-II. Perioperative right shoulder pain was noted in 6.67% cases in group-II which was managed by shoulder massage and Inj. Fentanyl while it was completely absent in group-I. SpO_2 level did not decrease below 95% in any patient in any group in any period. Spinal anaesthesia tends to cause peripheral vasodilatation. Hereafter, laparoscopic procedure done under spinal anaesthesia may increase the risk of hypotension. In a study hypotension was observed in 20.5% cases. Diaphragmatic irritation was much less in the present study, as there was subcostal instillation of Inj. Bupivacaine plain (0.2%) 10 ml each on both sides just prior to notch [9]. At times, this diaphragmatic irritation is so severe that there possibly will be alteration of the method to General Anesthesia. Using of low-pressure pneumoperitoneum was satisfactory, specifically with spinal group, as Spinal Anesthesia causes high level of motor, sensory and concerned barrier and thus good abdominal muscle relaxation equally paralleled to General Anesthesia. In Group-I, the initial increase in pulse rate and BP after peritoneal insufflations are due to both mechanical and neurohumoral properties [10]. The reappearance of pulse rate and BP to normal baseline was regular. There was little variation in pulse and BP in Group I after peritoneal insufflation compared with spinal anaesthesia. After more than a few minutes, the neurohumoral and mechanical properties are recompensed so that there is slight decrease in the pulse rate and BP. The reduction in pulse rate and BP in Group-II as equated to Group-I can be explained as as a result of decline in pain affected by residual analgesic consequence of local anesthetic in subarachnoid space. General anaesthetic is a choice of anaesthetic technique for laparoscopic procedures. Evidence based recent statistics suggest regional anaesthesia for laparoscopic cholecystectomy as a harmless, cost-effective and good postoperative pain control. But then there are fears linked to Spinal Anesthesia alike elevated intra-abdominal pressure consequential in regurgitation of gastric content. There is also a fear of hypotension throughout laparoscopic procedures completed under Spinal Anesthesia owing to the result of condensed intravenous return peripheral vasodilatation because of Spinal Anesthesia and also resulting in improved intra-abdominal pressure and inverted Trendelenburg position [11, 12].

The overall incidence of postoperative side effects was 12.9%. As has been reported previously [13, 14], the most frequently observed side effect was pain. The first analgesic administration occurred significantly earlier in patients receiving general anesthesia, confirming that immediate recovery from spinal anesthesia is generally easier [16]. The incidences of hypotension and bradycardia observed in this study as treatment-related side effects of spinal anesthesia were similar to those reported in previous studies [15]. Incidences of nausea and vomiting were comparable in both arms.

Finally, patient satisfaction was high and satisfaction scores were comparable for Spinal Anaesthesia.

LIMITATIONS OF THE STUDY

This was a clinical study in a single centre with small a sample size. So, the study results may not reflect the scenarios of the whole community. Large scale study is needed for better conclusions.

CONCLUSIONS

The patient's criteria, the anaesthesia and the type of surgery may influence the choice between Spinal anaesthesia and general anaesthesia. Spinal anesthesia is a valid alternative for anesthesia. Spinal Anaesthesia was observed to be better safety and sufficiency in patients of good health in the present study. It provides better post-operative pain regulator devoid of restraining the recovery, less postoperative nausea and vomiting and cost effectiveness as per our recommendation.

RECOMMENDATIONS

This study can serve as a pilot to a much larger research involving multiple centers that can provide a

nationwide picture, validate regression models proposed in this study for future use and emphasize points to ensure better management and adherence.

Ethical approval: The study was approved by the informed consent of the participant patients.

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