

Lap Cholecystectomy under Spinal Anesthesia- Comparative Study between Conventional-Dose and Low-Dose Hyperbaric Bupivacaine

¹Dr. Santosh Gupta, Post Graduate, Department of Anesthesiology, GMC, Jammu

²Dr. Danish Sharma, Senior Resident, Department of Surgery, GMC, Chandigarh

³Dr Arjit Kapoor, Post Graduate, Department of Surgery, ASCOMS and Hospital, Jammu

Corresponding Author: Dr Arjit Kapoor, Post Graduate, Department of Surgery, ASCOMS and Hospital, Jammu

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Abstract

Introduction: The way the anesthesia acts depend on the dosage, strength, and amount of the drug utilized. Aside from its use in spinal anesthesia, baricity refers to the anaesthetic solution's relative density in relation to cerebrospinal fluid (CSF).

Aim: To compare spinal anesthesia using conventional-dose and low-dose hyperbaric bupivacaine among patients underwent lap cholecystectomy.

Material and methods: The current observational study was undertaken in Government Medical College, Jammu for a period of 18 months from January 2023 to June 2024 after acquiring the ethical license from institutional authorities. A total of 120 patients who had lap cholecystectomy were categorized into two groups, included and studied in the trial after giving their informed consent; and the current observations of both groups were compared.

Result: In groups A and B, patients reported nausea in 2% and 4% of instances, vomiting in 1% and 2% of cases, and shoulder soreness in 9% and 13% of cases, respectively. Midazolam was administered to two patients in group A and one patient in group B. Rescue fentanyl was administered to 5% and 7% of participants in groups A and B, respectively. In groups A and B, hypotension was reported by 16% and 6% of patients, respectively, whereas bradycardia was noted in 6% and 1% of patients.

Conclusion: It is concluded that there was significant impact of anaesthesia dose on early recovery and restoring sensory and motor functions

Keywords: Bupivacaine, Spinal anaesthesia, Surgery, Outcome, Cholecystectomy and Laparoscopic surgery.

Introduction

Gallstones are prevalent in the majority of developed countries. It is estimated that around 5,000

cholecystectomies and 10,000 fatalities are attributed to this condition annually in the United States.¹ According to many ultrasonographic surveys, gallstone disease is present in Europe in 5% to 15% of cases.² Gallstone disease affects 3% to 10% of people in Asian nations.³ The prevalence of gallstone disease was 3.2% in Japan⁴, 10.7% in China⁵ and 7.1% in Northern India⁶ according to recent studies and research.

When laparoscopic procedures were first introduced in the 1970s, they were one of the most popular day care procedures. The preferred treatment for cholelithiasis is laparoscopic cholecystectomy since it reduces postoperative pain and necessitates a brief hospital stay.^{7,8}

In spinal anesthesia, a neuraxial anesthesia technique, a local anesthetic is delivered directly into the intrathecal space (subarachnoid space).⁹

Conventional-dose spinal hyperbaric bupivacaine with fentanyl was shown to give effective anesthesia for laparoscopic cholecystectomy.¹⁰

Conventional doses of isobaric bupivacaine make extensive sensory and motor block, which makes it more difficult for medical personnel to transport the patient from the operating room and inconvenient for the patient. Urinary retention risk is also linked to it. The spread of sensory and motor block is more predictable with hyperbaric bupivacaine. The use of spinal blocks with low effective dosages for a particular kind of operation, known as selective spinal anesthesia (SSA), has grown significantly in popularity.¹¹

Thus, the present study was conducted to compare spinal anesthesia using conventional-dose and low-dose hyperbaric bupivacaine among patients underwent lap cholecystectomy.

Material and methods

The current observational study was performed in GMC, Jammu over a period of 18 months from January 2023 to June 2024 after getting ethical authorization from institutional authorities. After taking informed consent a total of 120 patients who underwent lap cholecystectomy were included in the study.

Inclusion criteria

1. Age group 18-70 years.
2. ASA status I and II.
3. Patients underwent lap cholecystectomy.

Exclusion criteria

1. Patients with history of bleeding disorder, allergic to local anaesthetics, on anticoagulants, having infection at the site of spinal needle insertion and having spinal abnormalities.
2. Patients who refused to participate.
3. Psychologically unstable patients.
4. Patients with neurological impairment.
5. Patients with other comorbidities.

The selected patients were randomly categorized into two groups, i.e. Group A consisting 60 patients who received conventional lumbar spinal anesthesia (hyperbaric bupivacaine 15 mg and fentanyl 20 mg) and Group B consisting 60 patients who received low-dose thoracic spinal anesthesia (Hyperbaric bupivacaine 7.5 mg in combination with fentanyl 20 µg). Every patient's vital sign and hemodynamic condition were assessed before, during, and after operation. No premedication was given before induction of anesthesia. The standard laparoscopic techniques were opted for both the groups. The data was gathered using a clinical proforma. SPSS version 21.0 was used for analysis after the gathered data was entered into a Microsoft Excel sheet.

Observation and results

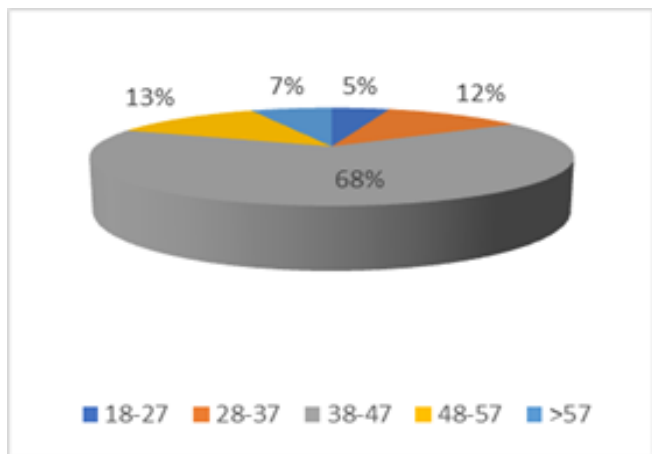


Figure 1: Age in years

Figure 1, shows that most of the study subjects were in the 38-47 years age group (68%), followed by 48-57 years (13%), 28-37 years (12%), > 57 years (7%) and 18-27 years (5%).

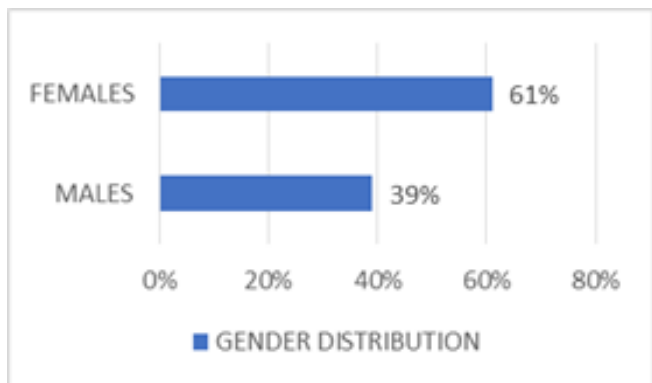


Figure 2: Gender distribution

Figure 2, presented the gender distribution in the current study. There was female predominance and female: male ratio was 1.6:1.

Table 1: Physical parameter

Parameters	Group A (n=60)	Group B (n=60)
Height (cm) (mean ± SD)	163.37±3.42	168.37±7.94
Weight (kg) (mean ± SD)	71.89±4.57	69.74±9
BMI (mean ± SD)	25.67±3.6	26.23±2.9

Table 1 shows the comparison of physiological parameters in both the groups. In group A mean height of the study subjects was 163.37±3.42 cm, mean weight of the study subjects was 71.89±4.57 kg and mean BMI was 25.67±3.6. In group B mean height of the study subjects was 168.37±7.94 cm, mean weight of the study subjects was 69.74±9 kg and mean BMI was 26.23±2.9.

Table 2: Comparison of perioperative period

Parameters	Group A (n=60)	Group B (n=60)
Time until T3(minutes) (mean±SD)	8.01±0.31	2.87±0.6
Surgical time (minutes) (mean±SD)	58.3±12.4	51.1±14.5
Pneumoperitoneum (minutes) (mean±SD)	38.5±9.4	31.3±10.2

Table 2 is showing the comparison of perioperative period among two groups. And a significant difference was found in the group A patients and group B patients. The mean time until T3 was 8.01±0.31 minutes, mean surgical time was 58.3±12.4 minutes and mean pneumoperitoneum was 38.5±9.4 minutes in group A. The mean time until T3 was 2.87±0.6 minutes, mean surgical time was 51.1±14.5 minutes and mean pneumoperitoneum was 31.3±10.2 minutes in group B.

Table 3: Comparison of perioperative period

Parameters	Group A (n=60)	Group B (n=60)
Shoulder pain (%)	9	13
Nausea (%)	2	4
Vomiting (%)	1	2
Doses of midazolam (mg)	2	1
Rescue fentanyl (%)	5	7
Hypotension (%)	16	6
Bradycardia (%)	6	1

Table 3 is comparing the perioperative period among both the groups. In group A and B shoulder pain was reported in 9% & 13% patients respectively, nausea was reported in 2% & 4% patients respectively, vomiting in 1% and 2% respectively, dose of midazolam is given to 2 patients in group A and to 1 patients in group B. Rescue fentanyl was given to 5% and 7% in group A & B respectively. 16% in group A and 6% in group B had hypotension and bradycardia was reported in 6% and 1% in group A and B patients.

The present study compared the sensory block and motor block in both the groups. In group A the duration of sensory and motor block was 3.62 ± 0.16 hours and 2.27 ± 0.02 hours respectively. In group B the duration of sensory and motor block was 2.14 ± 0.09 hours and 1.05 ± 0.2 hours respectively.

Discussion

During a laparoscopic cholecystectomy, regional anesthetic lowers the operative stress reaction. There is minimal risk of deep vein thrombosis and no airway instrumentation during regional anesthesia.¹²

Because active expiration is necessary to sustain lung ventilation in patients with obstructive airway disease, using relatively large doses of local anaesthetics can have disastrous results. Therefore, administering an appropriate dosage of local anaesthetics should decrease the degree of nerve block and muscular paralysis.¹³

In current study, the spinal anaesthesia using conventional-dose were compared the low-dose hyperbaric bupivacaine among patients underwent lap cholecystectomy.

The majority of the study participants were between the ages of 38 and 47. The ratio of males to females was 1.6:1. In group A, the study participants' average height was 163.37 ± 3.42 cm, their average weight was

71.89 ± 4.57 kg, and their average BMI was 25.67 ± 3.6 . The study participants in group B had a mean height of 168.37 ± 7.94 cm, a mean weight of 69.74 ± 9 kg, and a mean BMI of 26.23 ± 2.9 . These findings are similar to the study performed by Dr. Haque MM et al. (2024)¹⁴ found that the majority of the study subjects were in 36-45 years age and majority of the subjects were females. The mean weight of the study subjects in two groups was 73.6 ± 12.4 kg & 71.0 ± 13.1 kg, mean height of the study subjects in two groups was 164.3 ± 8.3 cm & 161.3 ± 7.9 cm, the mean BMI was 28.3 ± 4.3 kg/m³ & 25.6 ± 4.8 kg/m.³ Another study performed by Ellakany M (2013)¹⁵ found that the most of the study subjects were females. The mean age of the participants was 45.9 ± 13.6 years and 44.3 ± 13.2 years. The mean height of the study subjects was 169.4 ± 4.2 cm and 168.5 ± 5.6 cm, the mean weight was 85.6 ± 12.6 kg and 85.8 ± 15.2 kg and mean BMI was 29.8 ± 4.1 kg/m² and 30.0 ± 3.9 kg/m².

In group A, the average time to T3 was 8.01 ± 0.31 minutes, the average time for surgery was 58.3 ± 12.4 minutes, and the average time for pneumoperitoneum was 38.5 ± 9.4 minutes. In group B, the average time to T3 was 2.87 ± 0.6 minutes, the average time for surgery was 51.1 ± 14.5 minutes, and the average time for pneumoperitoneum was 31.3 ± 10.2 minutes. Patients in groups A and B reported shoulder discomfort in 9% and 13% of cases, nausea in 2% and 4% of cases, and vomiting in 1% and 2% of cases, respectively. Two patients in group A and one patient in group B received a dosage of midazolam. In groups A and B, 5% and 7%, respectively, received rescue fentanyl. Bradycardia was observed in 6% and 1% of patients in groups A and B, respectively, while hypotension was experienced by 16% and 6% of patients in groups A and B. The

interpretation of the current study shows a significant difference between group A and group B. These findings are consistent to the study conducted by Imbelloni LE et al. (2011) categorised the patients into two groups. Group A received high dose and group B received conventional low dose anaesthesia and observed the shoulder pain among 10 patients in group A and 18 patients in group B, nausea and vomiting was reported in one patient in group B, dose of midazolam was required in 3 patients and 2 patients respectively, hypotension was found in 27 patients and 10 patients respectively and bradycardia was reported in 8 patients and 2 patients in group A & B respectively.⁷ In other study conducted by Kour L et al. (2017) reported the shoulder pain among 4 and 6 patients in group A and B respectively, hypotension in 16.67% & 12% in group A and B respectively and bradycardia among 10% and 6.67% respectively. As well as the mean duration of sensory: motor block among group A and group B was 160.10: 90.33 minutes and 120.03:60.10 minutes respectively.⁸

Conclusion

The present observational study concluded that low-dose thoracic spinal anesthesia (Hyperbaric bupivacaine 7.5 mg in combination with fentanyl 20 µg) is an better options for lap cholecystectomy than conventional lumbar spinal anesthesia (hyperbaric bupivacaine 15 mg and fentanyl 20 mg). As low dose anaesthesia is having the benefits of early and rapid restoration of sensory and motor functions and early discharge of patients from hospital.

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