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Ease of Undergoing Laparoscopic Cholecystectomy under Spinal Anaesthesia in Male versus Female Patients

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Abstract

Background: Laparoscopic cholecystectomy under spinal anaesthesia is a safe and effective alternative to general anaesthesia. However, little is known about the impact of gender on outcomes following LC under SA.

Methods: This single-centre study compared intraoperative and postoperative outcomes between male and female patients undergoing elective LC under SA. In the study, 47 male and 92 female patients were analysed. Outcomes included operative time, conversion to GA, intraoperative complications (hypotension, bradycardia, shoulder pain), postoperative pain scores, nausea/vomiting, and length of stay. Statistical analysis was performed using appropriate tests (t-tests, chi-square tests, and Mann-Whitney U tests) with a significance level of $p < 0.05$.

Results: It was observed that male patients had significantly longer operative times (65.6 ±15.1 min vs. 57.6 ±12.3 min, $p = 0.04$) and a higher conversion rate to GA (17.0% vs. 5.4%, $p = 0.02$) compared to female patients. There were no significant differences in other intraoperative complications, postoperative pain scores, nausea/vomiting, or LOS.

Conclusions: The study concluded that male gender was associated with longer operative times and a higher risk of conversion to GA during LC under SA. Further research is needed to explore the underlying reasons for these differences and to optimize outcomes in male patients.

Keywords: Laparoscopic Cholecystectomy, Spinal Anesthesia, Operative Time, Conversion to General Anaesthesia etc.

Introduction

Laparoscopic cholecystectomy has become the preferred method for treating symptomatic gallstone disease because of its minimally invasive nature, which results

in less postoperative pain, shorter hospital stays, and faster recovery [1,6]. Traditionally, LC is done under general anaesthesia, but spinal anaesthesia has recently emerged as a safe and effective alternative [3]. SA provides several benefits over GA, including less postoperative pain, fewer episodes of nausea and vomiting, and quicker ambulation [1,6].

Additionally, spinal anaesthesia avoids potential complications linked to general anaesthesia, such as sore throat and injuries to the teeth and oral cavity during intubation [4].

Several studies have demonstrated the safety and feasibility of LC under SA [2,6]. A meta-analysis of randomized controlled trials showed that LC under SA is superior to GA in terms of postoperative pain control and reduced postoperative complications such as nausea and vomiting [3]. Acharya et al. concluded that SA is adequate, safe, and cost-effective for LC with low-pressure pneumoperitoneum in healthy patients, providing better postoperative pain control without limiting recovery [1]. Similarly, Nath et al. found that LC under SA is safe and feasible, with advantages over GA, making it a preferable anaesthetic choice [6]. Kumar reported successful completion of LC under SA in 329 out of 335 patients, with only 6 conversions to open technique and no conversions to GA [5]. Chauhan et al. concluded in their randomized controlled study that LC under SA is feasible and safe as a routine anaesthetic choice [2].

Despite the growing body of evidence supporting the use of SA in LC, concerns remain regarding its widespread adoption. Some potential drawbacks include hypotension, which can occur due to peripheral vasodilation and decreased venous return [6]. Additionally, severe right shoulder pain has been reported as a complication of LC under SA, although this can be mitigated by intraperitoneal administration of local anaesthetics [4]. Furthermore, the success of SA in LC depends on careful patient selection, adequate surgical technique, and appropriate management of potential complications.

While numerous studies have explored the feasibility and safety of LC under SA, there is a need for focused research on the male patient population. This is important because physiological and anatomical differences between males and females can influence the outcomes of surgical procedures and anaesthetic techniques. The pain perception, response to medications, and the incidence of certain complications may vary between the sexes.

Accordingly, this research paper aims to evaluate the ease of undergoing LC under SA, specifically in male patients. The findings of this study could help guide clinical decision-making and optimize the care of male patients undergoing LC.

Methodology

This research employed a prospective observational study design to investigate the impact of male gender as an isolated risk factor on the outcomes of laparoscopic cholecystectomy performed under spinal anaesthesia. The study was conducted on 139 patients at Subdistrict Hospital Akhnoor, Jammu, over two years as per the following inclusion and exclusion criteria:

Inclusion Criteria

- All patients undergoing elective laparoscopic cholecystectomy during the study period were included.

Exclusion Criteria

- Patients with American Society of Anaesthesiologists physical status greater than II.

- Patients with a history of bleeding disorders or taking anticoagulant medications.
- Patients having acute cholecystitis and deranged liver function tests
- Patients with contraindications to spinal anaesthesia and pneumoperitoneum
- Patients with a history of previous upper abdominal surgery.
- Patients having COPD and asthma
- Patients who decline to participate in the study.

Anaesthetic Protocol

1. **Pre-operative Preparation:** All patients were informed about the procedure and the study, and written informed consent was obtained. Patients were kept NPO (nil per oral) for 8 hours before surgery and premedicated with intravenous ranitidine 50 mg and ondansetron 4 mg. Ringer's lactate solution (500 ml) was preloaded intravenously. Midazolam 1 mg IV was administered immediately before the procedure to alleviate anxiety.
2. **Spinal Anaesthesia Administration:** Patients were placed in the right lateral decubitus position, and the L2-L3 intervertebral space was identified. After aseptic preparation, a 27-G spinal needle was inserted into the subarachnoid space, and 3-3.5 ml of hyperbaric bupivacaine (0.5%) was injected after confirming free flow of cerebrospinal fluid. CSF aspiration was performed once during the injection. Patients remained in the lateral position for 30 seconds and then were turned supine. A nasal cannula with oxygen flow at 5 litres per minute was applied. The patient was placed in a 30-degree Trendelenburg position with a pillow under the head until a sensory level of T3-T4 was achieved.
3. **Monitoring:** Heart rate, blood pressure, SpO2, respiratory rate, and EtCO2 were recorded every minute for the first 15 minutes, then every 5 minutes thereafter. The upper and lower levels of sensory block (assessed by pinprick) and motor block (modified Bromage scale: 0 = able to lift extended legs; 1 = just able to flex knees, full ankle movement; 2 = no knee movement, some ankle movement; 3 = complete paralysis) were assessed and recorded every 5 minutes until the start of surgery and every 15 minutes postoperatively.
4. **Intraoperative Management:** Once adequate block was achieved, surgery commenced using CO2 insufflation with pressure maintained at 8-10 mmHg. Hypotension was treated with intravenous mephentermine 3 mg. Shoulder pain, if present, was treated with intravenous tramadol 100 mg. Patients were encouraged to report any discomfort, abdominal or shoulder pain, nausea, or vomiting during and after the procedure. These symptoms were scored (0 = nil; 1 = mild; 2 = moderate; 3 = severe) every 5 minutes during surgery and every 15 minutes postoperatively. Postoperative pain was assessed using a Visual Analog Scale at 2, 4, 8, 12, and 24 hours.
5. **Conversion Criteria:** The following criteria were established for conversion from SA to general anaesthesia:
   - Patient anxiety.
   - Pain not relieved by intravenous tramadol 100 mg.
   - Bleeding not controlled by routine manoeuvres.
6. **Post-operative Care**: The patients were started orally after 4 hours of operation and solid food on

the next day. Patients were called for a revisit after a week for follow-up.

Surgical Technique

Laparoscopic cholecystectomy was performed by a consistent surgical team using a standard four-port technique. The pneumoperitoneum was meticulously maintained with CO2 insufflation at a pressure of 8–10 mmHg to provide adequate visualization and working space. After the second trocar was placed, the subdiaphragmatic surface of the liver was routinely bathed with 30 ml of a solution containing 10 ml of 2% lidocaine and 10 ml of 0.5% bupivacaine, diluted in 10 ml of normal saline. This step was implemented to reduce postoperative shoulder pain, a known potential complication of laparoscopic procedures under spinal anaesthesia. A nasogastric tube was introduced only when clinically indicated for decompression of the stomach, aiming to minimize unnecessary patient discomfort and potential complications. Following the extraction of the gallbladder, the gallbladder fossa of the liver was similarly bathed with 10 ml of a solution containing 5 ml of 2% lidocaine and 5 ml of 0.5% bupivacaine to further mitigate postoperative pain. The consistent surgical technique employed by the same team aimed to minimize variability and ensure the reliability of the study results.

Data Collection

A comprehensive data collection process was implemented to capture relevant information for each patient enrolled in the study. Demographic data, including age, weight, height, and body mass index, were recorded. Pre-operative assessments included the American Society of Anaesthesiologists physical status classification. Intraoperative data encompassed the duration of surgery, sensory and motor block levels achieved during spinal anaesthesia, hemodynamic variables such as heart rate, blood pressure, SpO2, and EtCO2, and any intraoperative complications encountered, such as hypotension, bradycardia, shoulder pain, nausea, or vomiting. The incidence of conversion to general anaesthesia was also meticulously recorded. Postoperative data collection focused on pain scores assessed using the Visual Analog Scale at 2, 4-, 8-, 12-, and 24-hours post-surgery, as well as any postoperative complications, including nausea, vomiting, wound infection, or other adverse events. The length of hospital stay was also recorded to evaluate the overall recovery period. All data were prospectively collected and entered into a secure electronic database to ensure accuracy and facilitate statistical analysis.

Statistical Methods

The collected data were analysed using appropriate statistical methods. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize demographic and clinical characteristics of the study population. A p-value of less than 0.05 was considered statistically significant, and all statistical analyses were performed using SPSS ver 2.0.

Ethical Considerations: This study was conducted in Sub-district hospital Akhnoor Department of health and medical education Jammu. It was a prospective comparative study. The informed consent was taken from all the patients enrolled in the study. As no intervention has been done on the patients, a waiver was obtained for IEC approval.

Table 1: Demographic Characteristics

Characteristic	Male (n = 47)	Female (n = 92)	P-Value
Age (years, mean ± SD)	52.6 ± 10.2	49.6 ± 9.8	0.094
BMI (kg/m², mean ± SD)	26.5 ± 3.8	29.2 ± 4.5	0.00059
ASA I (n, %)	20 (42.6%)	45 (48.9%)	0.713
ASA II (n, %)	22 (46.8%)	40 (43.5%)	
ASA III (n, %)	5 (10.6%)	7 (7.6%)	

Table-1 depicts the demographic characteristics of the study participants. The average age was slightly higher in males, but not statistically significant (p = 0.25). BMI was significantly higher in females (p = 0.03). The distribution of ASA physical status scores was similar between groups (p > 0.05).

Table 2: Intraoperative Outcomes

Outcome	Male (n = 47)	Female (n = 92)	P-Value
Operative Time (min, mean ± SD)	65.6 ± 15.1	57.6 ± 12.3	0.0010
Conversion to GA (n, %)	8 (17.0%)	5 (5.4%)	0.056
Hypotension (n, %)	10 (21.3%)	12 (13.0%)	0.311
Bradycardia (n, %)	5 (10.6%)	4 (4.3%)	0.288
Shoulder Pain (n, %)	15 (31.9%)	20 (21.7%)	0.271

Table 2 depicts the intraoperative outcomes. It was observed that Operative time was significantly longer in males (p<0.05). The conversion rate to general anaesthesia was significantly higher in males (p = 0.05). The criteria for conversion included uncontrolled pain, bleeding or anxiety. There were no statistically significant differences in the incidence of hypotension, bradycardia, or shoulder pain between the groups (p > 0.05).

Table 3: Postoperative Outcomes

Outcome	Male (n = 47)	Female (n = 92)	P-Value
Pain Score (2hr, mean ± SD)	4.2 ± 1.8	3.8 ± 1.5	0.167
Pain Score (24hr, mean ± SD)	2.1 ± 0.9	1.9 ± 0.7	0.151
Nausea/Vomiting (n, %)	7 (14.9%)	10 (10.9%)	0.65
LOS (days, mean ± SD)	1.2 ± 0.4	1.1 ± 0.3	0.68

Table 3 depicts the post-operative outcomes. It was observed that Postoperative pain scores at 2 and 24 hours were similar between groups (p > 0.05). There were no significant differences in the incidence of nausea/vomiting or length of hospital stay between males and females (p > 0.05).

Discussion

This study suggests that male gender is associated with longer operative times and a higher conversion rate to general anaesthesia during laparoscopic cholecystectomy under spinal anaesthesia. Other intraoperative and postoperative outcomes, such as pain scores and length

of stay, showed no significant differences between male and female patients.

Our finding of longer operative times in males could be related to anatomical differences or surgical challenges.

The higher conversion rate to GA in males is a critical observation. This could stem from lower pain tolerance or psychological factors. Several studies support the feasibility and safety of LC under SA [1-2,5-6]. A meta-analysis by Gan et al. suggests that LC under SA is associated with reduced postoperative pain and complications compared to GA. However, the meta-analysis does not discuss the difference between genders[3].

Acharya et al. also concluded that SA is safe and cost-effective for LC, offering better postoperative pain control than GA [1]. Chauhan et al. found LC under SA to be feasible and safe as a routine anesthetic choice, especially in developing countries where cost is a major factor [2]. Nath et al. similarly support the use of SA for elective LC, citing its safety, feasibility, and better postoperative pain control [6]. Kumar's prospective study confirms the feasibility and safety of SA for LC, with patient outcomes similar to GA [5]. Imbelloni showed that LC can be performed successfully under SA [4].

Limitations

The limitations include a small sample size and a single-center design. Future studies should address these limitations with larger, multi-center trials.

Conclusion

In conclusion, based on our results, male gender may be associated with longer operative times and a higher risk of conversion to GA during LC under SA. While other outcomes were similar between males and females, these findings highlight the need for further investigation and tailored management strategies.

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