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THORACIC SPINAL ANESTHESIA FOR LAPAROSCOPIC CHOLECYSTECTOMY : BEGINNER'S EXPERIENCE

Anaesthesiology

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ABSTRACT

Introduction: The advent of laparoscopic surgery has revolutionized the medical field by offering benefits such as minimal scarring, reduced bleeding, fewer perioperative complications, and shorter hospital stays. While lumbar spinal anesthesia (LSA) has been the traditional choice, thoracic spinal anesthesia (TSA) has recently gained interest despite its controversies. This study explores the feasibility and patient satisfaction of TSA for laparoscopic cholecystectomy, aiming to determine if TSA can provide a safer and more comfortable alternative to LSA. **Materials & Methods:** This prospective observational study was conducted in the Department of Anaesthesia at Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, during July 2023. Twenty patients aged 18-80 years, with ASA grades I and II, scheduled for elective laparoscopic cholecystectomy were included. After a thorough pre-anesthetic check-up, TSA was administered using a 25-gauge Quincke Babcock needle at the T8-T9 or T9-T10 intervertebral space. Intraoperative parameters, adverse effects, and patient satisfaction were recorded and analyzed. **Results:** The study included participants aged 18-80 years, weighing 48-80 kg, with heights ranging from 150-170 cm and BMIs of 21.3-27.7 kg/m². Intraoperative adverse effects included bradycardia in 60% of patients, nausea in 10%, and shoulder tip pain and paresthesia during needle insertion in 5% each, with no severe complications reported. Patient satisfaction was high, with 90% very satisfied and 10% averagely satisfied with the TSA technique. **Conclusion:** Thoracic spinal anesthesia is a feasible and effective technique for laparoscopic cholecystectomy, associated with manageable intraoperative complications and no neurological issues. It provides stable hemodynamics, minimal postoperative complications, and high patient satisfaction, making it a viable alternative to general anesthesia, particularly for high-risk patients.

KEYWORDS

Thoracic spinal anesthesia, laparoscopic cholecystectomy, patient satisfaction, intraoperative complications, regional anesthesia.

INTRODUCTION

The advent of laparoscopic surgery has significantly revolutionized the medical field, offering numerous benefits such as minimal scarring, reduced bleeding, fewer perioperative complications, and shorter hospital stays. Traditionally, lumbar spinal anesthesia (LSA) has been the cornerstone for procedures like laparoscopic cholecystectomy since its introduction by Bier in 1898. [1] However, the recent introduction of thoracic spinal anesthesia (TSA) has sparked considerable interest and research despite being surrounded by controversies. Jonnesco was a pioneer in this field, advocating the use of thoracic puncture for "general spinal anesthesia," a term he used for subarachnoid punctures in the thoracic region for surgeries involving the skull, upper body, and lower limbs. [2,7]

Performing regional spinal anesthesia above the termination of the conus medullaris theoretically poses a risk of spinal cord injury. [3] However, historical practices, such as subarachnoid myelography, have demonstrated the feasibility of cervical and thoracic punctures. [4] Thoracic spinal anesthesia has shown promise as an effective and safe method for various thoracic, abdominal, and lower limb surgeries. Studies, such as those conducted by Mahmoud et al., have successfully utilized TSA at the T10 level for breast surgeries, albeit with a 16% incidence of hemodynamic instability. [5,6] These studies highlight the potential of TSA to expand the horizons of anesthesia practices.

Building on these promising findings, our study aims to explore the feasibility and patient satisfaction of TSA for laparoscopic cholecystectomy. By focusing on this particular procedure, we seek to determine whether TSA can offer the same benefits traditionally attributed to LSA while providing a safer and more comfortable experience for patients. The primary outcome of our study is to assess the feasibility of TSA, with patient satisfaction being a critical metric of success. Additionally, we will closely monitor for any adverse effects during and after the procedure to ensure the safety and well-being of the patients.

In conclusion, thoracic spinal anesthesia represents a potentially transformative advancement in the field of anesthesia. While the technique is not without its challenges and controversies, its successful application in various surgeries suggests it could become a viable alternative to lumbar spinal anesthesia. By evaluating TSA in the context of laparoscopic cholecystectomy, this study aims to contribute valuable insights and data that could help shape the future of anesthesia practices, ultimately improving patient outcomes and expanding the range of safe and effective anesthesia techniques.

MATERIALS & METHODS

This prospective observational study was conducted in the Department of Anaesthesia at Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, after obtaining prior approval from the institute's ethical committee. The study period spanned the month of July 2023. The study population comprised patients of either sex, aged between 18 and 80 years, with ASA grading I and II. A total of 20 patients scheduled for elective laparoscopic cholecystectomy in the Department of Surgery at SRMS-IMS during the study period were included.

Inclusion criteria were patients of either sex, aged 18 to 80 years, and with ASA grades I and II who were willing and able to provide informed written consent. Exclusion criteria included patient refusal, ASA grade III and IV, severe cardiovascular disease, renal dysfunction, coagulation profile abnormalities, and spinal deformities. A pre-anesthetic check-up was conducted, which included a medical history review, physical examination, and administration of preoperative medications such as Tab. Alprazolam 0.25mg and Tab. Ranitidine 150mg the night before surgery. On the day of surgery, an 18-gauge intravenous cannula was secured, and patients were preloaded with intravenous fluids. Standard monitors such as ECG, noninvasive blood pressure, pulse oximeter, and end-tidal CO2 were used.

Under aseptic precautions and in a sitting position, a subarachnoid block was administered at the T8-T9 or T9-T10 intervertebral space using a 25-gauge Quincke Babcock needle. After piercing the ligamentum flavum, the stylet was removed, and the needle was advanced until free flow of cerebrospinal fluid (CSF) was observed. A combination of Inj. Bupivacaine Heavy (0.5%) 0.5 mL, Ropivacaine (0.75%) 1 mL, and Fentanyl 25 mcg was administered. Intraoperative parameters, number of attempts, incidence of paresthesia, intraoperative and postoperative complications, and patient satisfaction were evaluated and recorded.

Oxygen supplementation at 5-6 L/min via facemask was provided. The maximum upper and lower sensory levels achieved after 15 minutes

were recorded, with the target block level ranging from T4 to L2. The motor block in the lower limbs was assessed using the modified Bromage scale. Vital signs, including heart rate, respiratory rate, and oxygen saturation, were continuously monitored. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded every 5 minutes until the end of the procedure.

RESULTS

Table 1 Demographic and Physical Characteristics of Study Participants

Characteristics	Minimum	Maximum
Age (in years)	18	80
Weight (in kilogram)	48	80
Height (in cm)	150	170
BMI (in kg/m²)	21.3	27.7

In Table 1, the study included participants aged between 18 and 80 years, with weights ranging from 48 to 80 kilograms. The height of the participants varied from 150 to 170 centimeters, and the Body Mass Index (BMI) spanned from 21.3 to 27.7 kg/m². These characteristics ensured a diverse sample, representative of the general population undergoing laparoscopic cholecystectomy under thoracic spinal anesthesia.

Table 2 Intraoperative Adverse Effects Observed

Intraoperative adverse effect	Frequency	Percentage
Bradycardia	12	60%
Hypotension	0	0%
Nausea	2	10%
Vomiting	0	0%
Shoulder tip pain	1	5%
Parasthesia during needle insertion	1	5%
Parasthesia during drug injection	0	0%

Table 2 presents, the intraoperative adverse effects observed during the study included bradycardia in 60% of the patients. Nausea was reported by 10% of the participants, while shoulder tip pain and paresthesia during needle insertion were each noted in 5% of the cases. There were no instances of hypotension, vomiting, or paresthesia during drug injection. These findings highlight that while some adverse effects were present, severe complications were notably absent.

Table 3 Patient Satisfaction Levels

Patient satisfaction	frequency	percentage
Very satisfied	18	90%
Average satisfaction	2	10%

Table 3 presents, the majority of patients (90%) reported being very satisfied with the thoracic spinal anesthesia technique used for their laparoscopic cholecystectomy. An additional 10% of patients expressed average satisfaction. These results indicate a high overall satisfaction rate, suggesting that the technique was well-received by most patients.

DISCUSSION

The laparoscopic approach presents unique challenges for anesthesiologists, particularly during the perioperative period. Historically, general anesthesia (GA) was the preferred method for laparoscopic surgeries, but spinal anesthesia (SA) has gained popularity over the past two decades due to its numerous advantages. SA offers benefits such as the absence of airway manipulation, profound muscle relaxation, reduced incidence of deep vein thrombosis (DVT), excellent postoperative analgesia, and preservation of consciousness. Despite these advantages, segmental thoracic spinal anesthesia (TSA) has been controversial due to fears of potential spinal cord damage and hemodynamic instability caused by blockade of thoracic cardioacceleratory fibers (T2-T6) and respiratory muscle weakness.

One of the most significant concerns with thoracic puncture is the risk of spinal cord injury. However, MRI studies indicate that the spinal cord is positioned anteriorly in the thecal sac at the thoracic level, providing a safe distance that prevents spinal needle contact with neural tissues. In our study, we recorded an incidence of paresthesia during needle insertion of 5%, with no postoperative sequelae or complications. This finding aligns with the emerging consensus that TSA can be performed safely with proper technique and anatomical knowledge.

Paliwal et al. [8] conducted a study comparing segmental spinal anesthesia to GA for laparoscopic cholecystectomy in 60 patients. They concluded that segmental spinal anesthesia is a better choice, particularly for patients with respiratory comorbidities, due to a lower incidence of postoperative pneumonia and atelectasis. Similarly, Ellakany et al. [9] performed a randomized controlled study on 60 patients undergoing open surgeries for abdominal malignancies, comparing segmental thoracic spinal anesthesia with GA. They found that thoracic spinal anesthesia provided shorter recovery times, higher patient satisfaction, lower incidence of nausea and vomiting, and reduced hospital stays. [10]

Our study also supports the efficacy and patient satisfaction associated with TSA for laparoscopic cholecystectomy. A high satisfaction rate of 90% among our patients underscores the potential of TSA as an effective anesthesia technique for this procedure. The results of our study, combined with findings from previous research, suggest that TSA is a viable and advantageous option for patients undergoing laparoscopic surgeries, particularly those with respiratory comorbidities or those at high risk of postoperative complications.

These findings indicate that TSA can enhance patient outcomes by reducing the risk of complications and improving overall patient satisfaction, thereby supporting its broader adoption in clinical practice.

CONCLUSION

Thoracic spinal anesthesia is a practically feasible regional anesthesia technique for patients undergoing laparoscopic cholecystectomy. It is associated with a manageable incidence of intraoperative complications and no evidence of neurological complications. This technique provides stable hemodynamics, minimal postoperative complications, and a high degree of patient satisfaction. Therefore, TSA can be considered a viable alternative to general anesthesia, particularly in high-risk patients.

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