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ORIGINAL ARTICLE

Laparoscopic Cholecystectomy Under Regional Anaesthesia (Thoracic Spinal): Is It Feasible?

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Abstract

Introduction: Laparoscopic cholecystectomy is classically done under General Anaesthesia as a gold standard. But in this era where regional anaesthesia is gaining more prominence, we wondered about the safety and efficacy of regional anaesthesia for doing Laparoscopic Cholecystectomy. It is considered to have an advantage over General Anaesthesia (GA), especially in cases where a higher risk of morbidity due to GA is present. It also provides excellent pain relief postoperatively, reducing the usage of opioid analgesics and shortening duration of stay. **Aims:** To evaluate the safety and efficacy of Thoracic Spinal Anaesthesia in Laparoscopic Cholecystectomy through a Surgeon Satisfaction Score (SSS), intra op monitoring and post operative care. **Methods and Materials:** 45 cases of Chronic Calculous Cholecystitis belonging to ASA Grade I and II, without any comorbidities underwent Laparoscopic cholecystectomy under Thoracic spinal anaesthesia in Tezpur Medical College and Hospital, a tertiary care center. After the surgery, a Surgeon Satisfaction Score was calculated with following parameters - I) Absence of conversion to GA II) Absence of intra operative movements III) Abdominal relaxation during the surgery IV) Absence of Post operative complications after surgery and V) Timely discharge from hospital using 5-point Likert's scale. Likewise, intra op and post op vitals were monitored and analysed. **Results:** Thoracic Spinal anaesthesia was found to be adequate for surgery in all but one patient. Intraoperatively, two patients who experienced right shoulder pain received Inj Ketamine 25 mg and Inj Midazolam 1 mg. Two patients were given Mephenteramine 6 mg for hypotension. One patient was given Inj Atropine 0.6 mg for Bradycardia. Surgeon Satisfaction Score was Excellent for most patients. One patient was converted to General Anaesthesia. Postoperatively, three patient required antiemetic for nausea and vomiting. Two patients suffered urinary retention. 42 patients were discharged within 24 hours of surgery. **Conclusion:** Laparoscopic Cholecystectomy is feasible under Thoracic Spinal Anaesthesia with excellent Surgeon Satisfaction and minimal post operative complications for healthy patients and minimizes post operative hospital stay.

Keywords: Laparoscopic Cholecystectomy, Regional Anaesthesia, Thoracic Spinal Anaesthesia, Satisfaction Score

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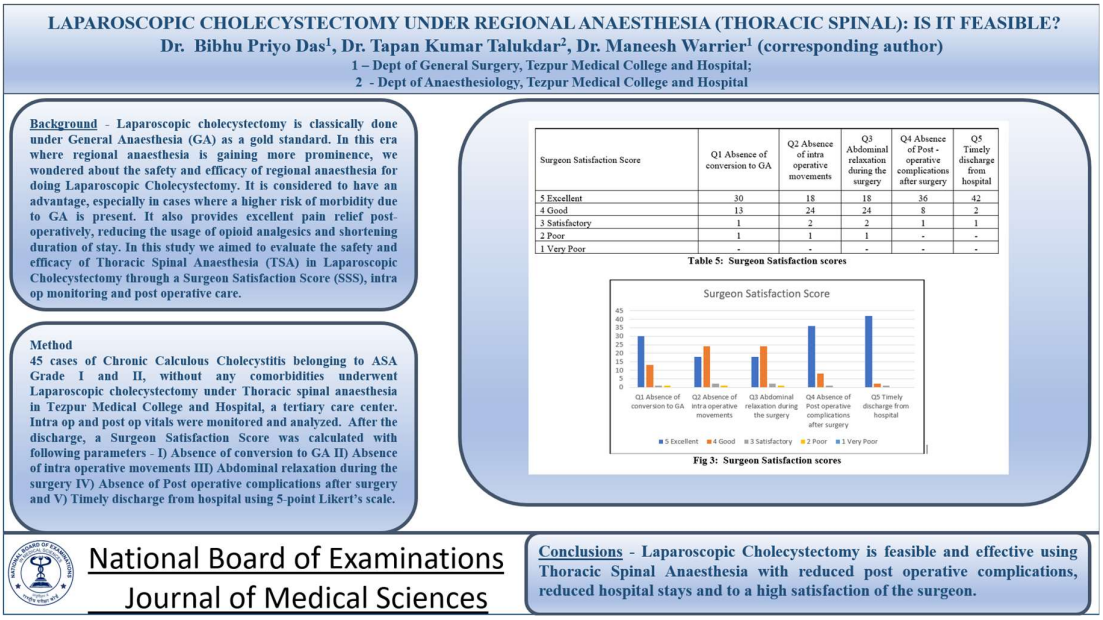
Graphical Abstract



Introduction

Laparoscopic Cholecystectomy is the gold standard surgical treatment for a case of gallstone disease. With the rise of Regional Anaesthesia, which involves blockade of central neuroaxis and/or peripheral nerve plexuses, it is now possible to achieve anaesthesia adequately without impairing the consciousness of the patient, allowing earlier recovery and discharge from hospital. However, even with the advent of newer methods of anaesthesia, Laparoscopic Cholecystectomies are still carried out under General Anaesthesia (GA) globally.

The aim of this study is to evaluate the safety and efficacy of Thoracic Spinal Anaesthesia (TSA) in Laparoscopic Cholecystectomy, through a Surgeon Satisfaction Score (SSS), intra op vitals monitoring and post operative care.

Materials and Methods

The study was approved by Ethical Committee of Tezpur Medical College and Hospital. Informed consent was taken from all participants of this study after detailed explanation of the procedure, its risks and benefits, and requirement of conversion to GA if needed. Inclusion criteria for this study were patients who were planned for elective Laparoscopic Cholecystectomy, aged between 18 years and 60 years, whose BMI were in between 18.5 and 23 and with ASA Grade I and II, with no co-morbidities. Exclusion criteria for the study were cases with Choledocholithiasis, Ca Gall bladder, Gall bladder perforations and Gall stones in pregnancy, ASA grading above II, spinal deformity, coagulopathies, allergy to local anaesthetics and those who refused consent for Thoracic Spinal Anaesthesia for Laparoscopic Cholecystectomy.

After detailed and thorough Pre-Anaesthetic check-ups, 45 patients were then taken up for surgery. The patients were premedicated with Intravenous Pantoprazole 40 mg and Ondansetron 4 mg, multi-parameter monitor connected and preoperative baseline heart rate, blood

pressure, MAP, ECG and SPO2 were recorded. The patients were placed in sitting position. Under aseptic precautions, sub-arachnoid space puncture was done at T9-T10 or T10-T11 level. 2 ml of isobaric levobupivacaine 0.5% with fentanyl 25 microgram was injected and patients were then made to lie in supine position. The sensory level was assessed with pin prick sensation and motor block was assessed with modified Bromage score. The vitals were recorded every 5 min till the completion of surgery. The procedure was started only when the minimum block extent included the T4 to L2 dermatomes evaluated by pinprick. Laparoscopic Cholecystectomy was performed as a standard four port technique.

Intra-operatively, all patients were co-loaded with 500ml of isotonic fluid. Oxygen supplementation was given through Hudson face mask with 6 litres of oxygen per minute. All patients were sedated with Inj Midazolam 1mg. Inj. Ketamine 25 mg was given if patient complained of shoulder tip pain. Hypotension (20% fall from baseline), was managed with Inj. Mephenteramine 6 mg and IV fluids bolus. Bradycardia (<50/min) was managed by Inj. Atropine 0.6mg. In postoperative period, sensory and motor function of upper and lower limb were assessed to rule out any neurological deficit.

Postoperative pain was assessed regularly using a visual analog scale (VAS) from 0 to 10, with 10 being most severe, for 24 hours. Intramuscular Diclofenac 75mg, a NSAID was used as analgesic if the VAS > 4 and supplemented with Inf. Paracetamol 1000 mg, if necessary. Patients were followed up and discharged after 24 hours if no complications were present and 48 hours if needed for any reason. Follow up of the patients was performed at the end of the second and fourth postoperative week.

A Surgeon Satisfaction Score, based on Likert's scale was assessed on 5-point scale with the points representing the following levels of satisfaction - **5) Excellent; 4) Good; 3) Satisfactory; 2) Poor; 1) Very poor**.

The parameters considered for Surgeon Satisfaction were I) Absence of conversion to GA II) Absence of intra operative movements III) Abdominal relaxation during the surgery IV) Absence of Post operative complications after surgery and V) Timely discharge from hospital.

The data collected was analysed using SPSS 16 software package. For continuous variables, mean and standard deviation were calculated. Absolute numbers and percentages were used for quantifying qualitative data.

Results

45 patients underwent Laparoscopic Cholecystectomy under spinal anaesthesia in Surgery OT of Tezpur Medical College, performed by two surgeons of Surgical unit 1 (Table 1).

Table 1. Distribution of the patients according to Age, Sex and ASA category

Variables	Number (N)	Percentages (%)
Age Category		
<20 years	2	4.4
21-30 years	7	15.6
31-40 years	23	51.1
41-50 years	10	22.2
51-60 years	3	6.7
Sex		
Male	9	20
Female	36	80
ASA I	40	88.9
ASA II	5	11.1

Analysis of Demographic data revealed a female preponderance among patients, with 36 females and 9 males included in the study. This corroborates the existing literature[1]. It was observed that majority of the study participants were in 31-40 years of age - 23 (51.1%). The mean age of the study participants 36.8 ± 8.71years with minimum age being 18 years and maximum age being 55 years. Most of the study participants 40 (88.9%) belonged to ASA I group. The mean body mass index was 20.91 ± 1.12 kg/m^2. The minimum body mass index of the study participants was 18.58 kg/m^2 and the maximum 22.97 kg/m^2.

All patients tolerated spinal anaesthesia well, and T3 was the highest degree of sensory blockade reached and lowest level reached was L3 (Table 2).

Table 2. Duration of Operative time and Pneumoperitoneum time

Variables	Pneumoperitoneum time (in minutes)	Operating time (in minutes)
Mean ± Standard deviation	33.3 ± 3.70	42.86±3.95
Minimum	18	36
Maximum	39	63

The mean operating time was found to be 42.86 ± 3.95 minutes and the time for when patient was under pneumoperitoneum was found to be 33.3 ± 3.70 minutes. An average of 1000 ml of isotonic fluid was infused throughout the operative procedure.

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Intra operative vitals were measured at regular intervals and plotted against a graph with respect to time as given below (Figure 1 and Table 3).

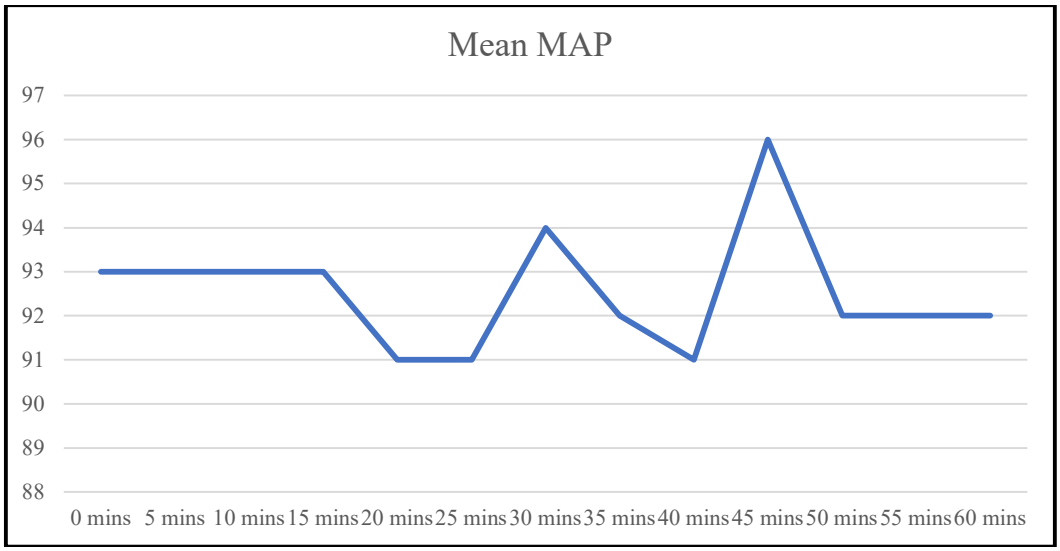

Figure 1. Chart showing variation of mean BP with respect to time

Table 3. Variation of mean BP with respect to time

Time	MAP	PR (beats/min)	sPO2 (%)
0	93	82	100
5	93	85	100
10	94	83	100
15	94	81	100
20	92	88	100
25	92	86	100
30	94	82	100
35	93	83	100
40	91	86	100
45	96	85	100
50	108	90	100
55	97	82	100
60	101	82	100

The mean BP with respect to time was plotted and charted. There was an increased incidence of reduced BP after administration of Thoracic Spinal anaesthesia possibly due to sympathetic blockade. Two patients developed hypotension which were corrected by Inj Mephenteramine 6 mg and one patient

developed bradycardia and was managed by Inj. Atropine 0.6 mg. Other patients did not have any major changes in the intra operative vital parameters. The mean O2 remained 100% due to delivery of oxygen through Hudson's mask.

One case was converted into GA due to I nadequate muscle relaxation and analgesia. Two patients presented with shoulder tip pain intra operatively which was managed with Inj. Ketamine 25 mg and Inj. Midazolam 1 mg iv. Peri-oral pruritis was present in two patients which was self-limiting (Table 4).

Table 4. Intra-operative complications

Shoulder pain	2
Hypotension	2
Hypertension	0
Bradycardia	1
Abdominal discomfort/pain	1
Pruritis	2
Respiratory Distress	0
Need for Ketamine	2
Need for Midazolam	2

In the post operative period, one patient developed nausea and two patients developed vomiting that was taken care of with Inj. Ondansetron 4mg. Two patients had urinary retention and needed indwelling catheter for 24 hrs. No patient developed Post Dural Puncture Headache.

Most patients had a VAS score of 3 or less after a period of 6 hours, and gradually developed pain at wound site the following day, which was easily managed by oral NSAIDs. However, 3 patients developed severe pain on the first day, with VAS score greater than 5 after 6 hours, that required administration of Inj. Diclofenac 75 mg IM (Tables 5 and 6; Figure 2).

Table 5. Post-operative complications

POST OPERATIVE COMPLICATIONS	**NUMBER**
Post operative Nausea and Vomiting	3
Urinary Retention	2
Severe wound site pain	3

Table 6. Post-operative VAS scores

VAS	2 hr	4 hr	6 hr	12 hr	24 hr
1	34	30	25	26	29
2	9	12	10	10	11
3	2	3	5	6	3
4	0	0	2	3	2
5	0	0	1	0	0
6	0	0	2	0	0

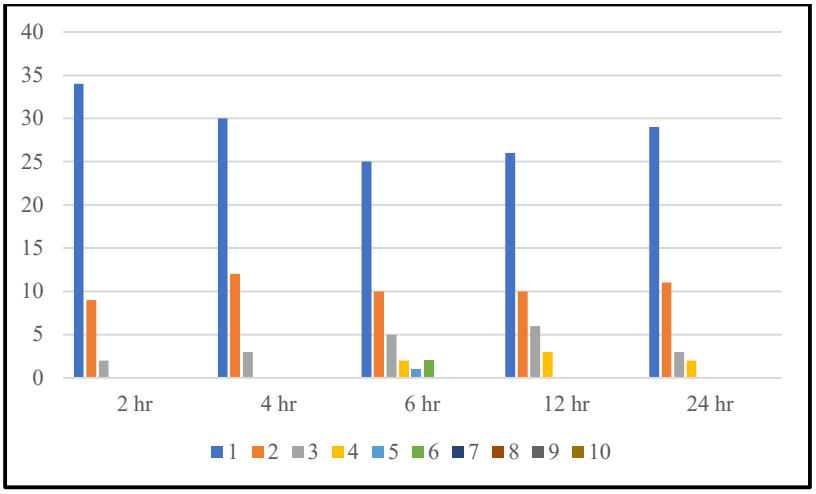

Figure 2. Post-operative VAS scores

A surgeon satisfaction score was calculated from a questionnaire that was filled at the time of discharge and compiled. Overall ease of doing surgery was measured as an average of the scores of each question. The scores were excellent for 36 cases, Very Good for 8 cases and Poor for 1 case which was converted to GA due to inadequate analgesia and muscle relaxation (Table 7 and Figure 3).

Table 7. Surgeon Satisfaction scores

Surgeon Satisfaction Score	Q1 Absence of conversion to GA	Q2 Absence of intra operative movements	Q3 Abdominal relaxation during the surgery	Q4 Absence of Post - operative complications after surgery	Q5 Timely discharge from hospital
5 Excellent	30	18	18	36	42
4 Good	13	24	24	8	2
3 Satisfactory	1	2	2	1	1
2 Poor	1	1	1	-	-
1 Very Poor	-	-	-	-	-

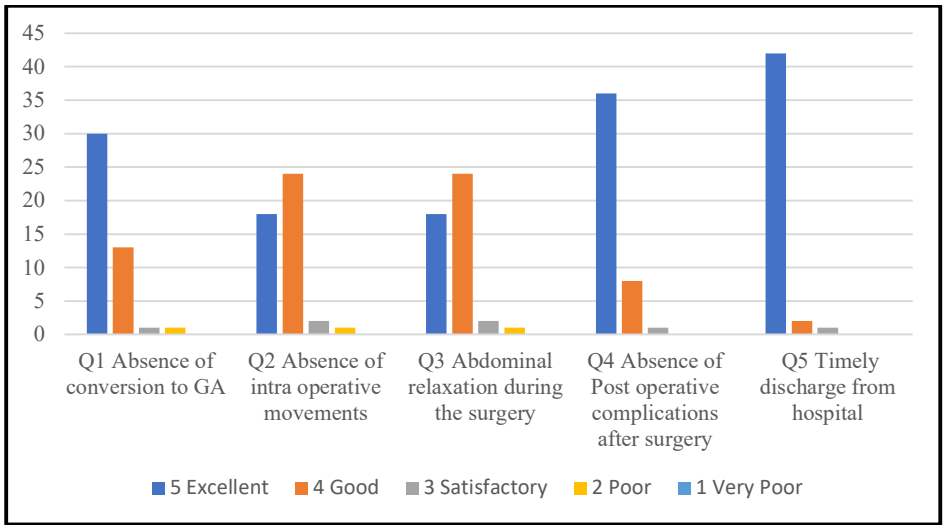

Figure 3. Surgeon Satisfaction scores

Forty-two patients were eligible for hospital discharge after 24 hours, two patients who developed vomiting were observed for 48 hours and discharged. One patient who was converted to General Anaesthesia due to difficulty in surgical procedure was discharged after 72 hours. There was no major morbidity and mortality observed in patients included in the study.

Discussion

Laparoscopic cholecystectomy is now a days considered gold standard for treating symptomatic cholelithiasis that is usually done under general anaesthesia but patients with major medical problems especially with hyperreactive airway disease and lung pathology who cannot withstand general anaesthesia and develop intra operative and postoperative complication , thereby increasing morbidity and mortality [2,3]. Van Zundert et al. reported that segmental spinal anaesthesia

can be used safely in patients with severe lung diseases. In our study we administered segmental thoracic spinal anaesthesia at lower level(T9-T11) which had the advantage of minimum haemodynamic fluctuation and less intra operative and postoperative complication.

In our study, all patients belonged to ASA 1 and 2 categories with no co morbidities with female preponderance and with normal BMI.

General anaesthesia has some limitation in patients with respiratory pathology and anticipated difficult intubation where it can interfere with the airway and cause threat to the pulmonary mechanics. Previous studies carried out by different authors compared GA vs thoracic spinal and reported that thoracic spinal anaesthesia leads to early ambulation, less haemodynamic fluctuation and greater patient satisfaction and greater surgical satisfaction [4].

In our study, two patients developed hypotension and one patient developed bradycardia. Literature shows that anaesthesia at lower thoracic levels with low volume of isobaric local anaesthetics causes exclusive blockade of thoracic fibres and sparing lumbo-sacral fibres so less venous pooling and low incidence of hypotension [5], even though it is a well-documented [6,7] adverse effect.

There was no problem in respiratory status of the patients due to the minimal and transient nature of the motor blockade in Thoracic spinal anaesthesia, a fact that is supported by literature [4,8]. The patients maintained Spo2 of 100 percent on routine oxygen supplementation with 5 litres of oxygen.

One patient developed right shoulder pain, due to the effect of pneumoperitoneum and the patient being awake, which caused him to perceive the sensation. The patient was managed by sedation, following which the surgery was uneventful.

One patient had to be converted to general anaesthesia as the patient was extremely anxious, and consciously contracted his abdomen, which made the surgery difficult. Consequently, abdominal relaxation was less. Tzovaras et al and Sinha et al also mentioned similar difficulties in their study [9,10].

Regarding post operative complications, post operative nausea vomiting most commonly encountered in three patients. The incidence, however is lesser than when conducted under general anaesthesia or open technique. However, urinary retention was found two patients, and this adverse effect is unique to spinal anaesthesia [11]. However, it was manageable and patient regained their normal bladder function the following day and was discharged with no negative outcome.

The VAS scores calculated at 6-hour interval post-surgery revealed severe pain require rescue analgesia in three patients. This could be due to inadequate drug delivery or faulty technique. Most of the similar studies revealed improved VAS scores in post operative period allowing for early mobilization and discharge [12-14]. Thus, Thoracic anaesthesia gives better outcomes in the post operative period and also upholds the principles of ERAS, reducing hospital stay.

Most patients, were discharged just within 24 hours of hospital stay. With further refinements and experience, it is possible to convert laparoscopic cholecystectomy to day case surgery, which is slowly but surely being adopted in many centres.

Conclusion

Laparoscopic Cholecystectomy is feasible and effective using Thoracic Spinal Anaesthesia with reduced post operative complications, reduced hospital stays and to a high satisfaction of the surgeon.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

Funding

No funding was received for conducting this study.

Ethical Approval

The study was approved by Ethical Committee of Tezpur Medical College and Hospital.

Informed Consent

Informed consent was taken from all participants of this study after detailed explanation of the procedure, its risks and benefits, and requirement of conversion to GA if needed.

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