Original Article

Laparoscopic Cholecystectomy Under Epidural Anesthesia: A Feasibility Study

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Abstract

Background: Laparoscopic cholecystectomy (LC) is normally performed under general anesthesia. But of late this operation has been tried under regional anesthesia successfully without any added complications like epidural anesthesia. **Aims:** The aim of the study was to study the feasibility of performing LC under epidural anesthesia in normal patients so that the benefits could be extended to those high-risk patients having symptomatic gallstone disease and compromised cardio-pulmonary status where general anesthesia is contraindicated. **Materials and Methods:** In all, 20 patients with the American Society of Anesthesiologist's class I or II were enrolled in the study. The level of epidural block and satisfaction score, both for the patient and the surgeon, were noted in the study. **Results:** The LC was performed successfully under epidural anesthesia in all but two patients who had severe shoulder pain in spite of giving adequate analgesia and were converted to general anesthesia. **Conclusions:** The LC can be performed safely under epidural anesthesia with understanding between patient and surgeon. However, careful assessment of complications in the patients should be done to make the procedure safer.

Keywords: Cholecystectomy, Epidural anesthesia, Laparoscopic, Shoulder pain

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Introduction

Traditionally laparoscopic cholecystectomy (LC) is performed under general anesthesia. With the advent of advanced laparoscopic surgical techniques, it has become possible to perform laparoscopic surgery of the gastrointestinal tract using epidural anesthesia.[1] In the past decade, many surgeons published case reports of LC that was performed in pregnant and non-pregnant patients while they were under epidural anesthesia.[2-5] Ji Hyun Lee *et al*.[6] have recently published their experience with LC being performed under epidural anesthesia in eleven patients.

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Based on our experience with open cholecystectomy done under epidural anesthesia, we evaluated our experience of LC using epidural anesthesia.

Materials and Methods

Ethical clearance was obtained from the institutes' ethical board. A total of 20 patients with ASA status I or II were included in the proposed study. Written informed consent was obtained from all the participating patients.

Inclusion criteria: Patients with ASA class I & II and aged between 18-60 years were included in the study.

Exclusion criteria: Patients below 18 years and above 60 years, those not willing to undergo LC, obese patients, patients with ASA III and above, patients presenting with acute symptomatology and suspected or proven gallbladder malignancy, patients having deranged bleeding parameters or vertebral column deformities, patients with proven or suspected common bile duct

stones and having history of jaundice or gallstone pancreatitis, were excluded from the study.

Anesthesia technique to be employed

The patient was placed in the sitting position. Continuous infusion was done with lactated Ringer's solution. Under all aseptic and antiseptic precautions, the epidural space was identified using 17-gauge Tuohy needle and loss of resistance technique, in the T9-T10 interspace or one or two spaces above or below this interspace when it was not possible in this space. An epidural catheter was secured about 3 cm cephalad beyond the needle tip. The patient was then placed in the supine position and 3 ml of 2% lidocaine with adrenaline (1:200000) was given as a test dose followed by 10 ml of 0.5% bupivacaine, which was given via the epidural catheter. Thereafter incremental doses of 3 ml of 0.5% bupivacaine was given till the desired level of block was reached.

The anesthetic solution was prepared using 18 ml of lidocaine 2% plus epinephrine (1:200000) and 2 ml of sodium bicarbonate 8.4%. After negative aspiration, 3 ml of the solution was administered as a test dose followed by an additional 7 ml along with 50 μg fentanyl and an additional 2 ml of the solution was administered incrementally to reach the desired level of segmental block. The upper and lower levels of sensory and motor block were assessed by a pinprick test and the Bromage scale, respectively, and recorded every 5 minutes until the start of surgery and every 15 minutes postoperatively.

Intraoperative anxiety was treated with midazolam, 1-2 mg; abdominal or referred shoulder pain with incremental fentanyl, 1-2 μg/kg; and hypotension with ephedrine, 5-10 mg; all as intravenous (I.V.) boluses as required. The discomforts of the patient, during and after the procedure, were recorded (for example: Pain, nausea, or itching). Nasogastric tube was inserted in all the patients. Oxygen at the rate of 6 liter/minute was supplied via a face mask to all the patients while monitoring the end-tidal carbon-dioxide.

Surgical technique

Surgery will be performed with the conventional four-port technique: One 10 mm trocar above the umbilicus, one 10 mm below the xiphoid, one 5 mm below the right costal margin at the mid-clavicular line and one more 5 mm trocar below the right costal margin at the anterior axillary line. Pneumoperitoneum will be established with carbon dioxide at a maximum intra-abdominal pressure of 10 mm Hg instead of the usual 15 mm Hg, to avoid shoulder pain due to diaphragmatic irritation. Operating table tilting to the left and also the patients head up which is the conventional position for LC will be kept to the minimum or none to avoid diaphragmatic irritation.

Simplified questionnaire forms were being developed for patients [Table 1] and also for the operating team [Table 2] to evaluate comments about the operation. The patients were asked to complete the questionnaire form on the first postoperative day. Visual analog scale (VAS) for pain was also checked on the first postoperative day. The surgeons completed the questionnaire forms immediately after the operation. Bromage scale [Table 3] was also noted during surgery to assess the intensity of motor blockade.

Results

All operations were completed laparoscopically without any need for open surgery. General anesthesia was required in two patients due to severe complaints of shoulder pain. Hypotension was observed in ten patients during surgery which was treated successfully with

Table 1: Questionnaire form for patient

How comfortable were you during the operation?
Comfortable
Not so comfortable
Uncomfortable
Any pain to the shoulders?
Yes
No
Are you happy with the procedure?
Yes
No
Would you advise the same procedure to your known persons?
Yes
No

Table 2: Questionnaire form for surgeon

How was the abdominal relaxation?
Adequate
Moderate
Poor
Was there any technical difficulty in relation to patient position?
A lot
Minimal
None
Was there any difference with EPIDURAL anesthesia?
Yes
No

Table 3: Bromage scale

0: able to lift extended leg
1: just able to flex knees, full ankle movement
2: no knee movement, some ankle movement
3: complete paralysis

intravenous ephedrine. Significant bradycardia, with a heart rate below 50 bpm, occurred in three patients. Eight patients experienced shoulder pain and five of them required intravenous fentanyl injection at a dosage of 50 μg. Two patients could not tolerate the shoulder pain and general anesthesia was given for them. Nausea and vomiting was not found in any patient.

The average total operation time was 44.4 minutes (range, 34-58 minutes) and total anesthesia time was 68.2 minutes (range, 52-89 minutes). All patients could ambulate 6 hours after the operation, and there were no complications or morbidity in the postoperative period. The mean hospital stay for the patients was one and a half day (range 1-3 days). Postoperatively all patients responded positively about the comfort of the operation and answered as "well" or "very well". The average patient's satisfaction score assessed at 3 hours after the operation was 8.2 (range, 7-9) and the average pain score (VAS) checked at 4 hours after operation was 2.1 (range, 1-3). Surgeons did not have problems with relaxation of musculature, or the surgical technique, and answered that there was no difference between the technique and general anesthesia.

Discussion

Regional anesthesia for LC is considered to have some advantages compared with general anesthesia. Patients can be awake and oriented at the end of the surgery and have less postoperative pain, nausea and vomiting. Problems related to general anesthesia such as oral and teeth injury during laryngoscopy, and a sore throat and stomach inflation as a result of mask ventilation could be avoided in a regional anesthetic setting.[7] For the successful completion of LC under regional anesthesia, neuraxial blockade must be performed to cover T6 level or above as demonstrated by Lal *et al*.[8]

Referred shoulder pain due to diaphragmatic irritation from carbon dioxide pneumoperitoneum was a significant intraoperative problem. Eight patients (40%) experienced shoulder pain and five of them required intravenous fentanyl injection at a dosage of 50 μg. Two patients could not tolerate the shoulder pain and were converted to general anesthesia. Sinha *et al* [9] reported shoulder pain in 12.29% of patients, whereas Pursnani *et al*.[4] noted shoulder pain occurred in 2 of their 6 patients operated under epidural anesthesia, and was easily manageable with reassurance, no medical treatment, or simple analgesics. The higher incidence of shoulder pain in our patients might be due to relative inexperience of the operating surgeons as the procedure was carried out in our hospital for the first time. Shoulder pain may be managed by using nitrous oxide [7], gentle surgical manipulation [10], nasogastric tube insertion for gastric decompression [11], irrigation of the right diaphragm with 2% lidocaine solution[12], phrenic nerve block and addition of non-steroidal anti-inflammatory drugs.[13,14] No significant changes were noted in the respiratory parameters during epidural anesthesia in any patients similar to the findings by Ciofolo *et al*.[15]

Zhang *et al*.[16] in their retrospective analysis of 100 patients undergoing LC under epidural anesthesia while compared with similar number of patients undergoing LC under general anesthesia has concluded that LC is feasible under epidural anesthesia and is a safe procedure in selected patients. Most of the patients regarded epidural anesthesia as a comfortable procedure with lesser cost than those undergoing the same procedure under general anesthesia.

Ross *et al*.[17] in their study of laparoendoscopic single-site (LESS) surgery for cholecystectomy under epidural anesthesia in 20 patients with a single incision around umbilicus has concluded that epidural anesthesia appears to be a preferable alternative to general anesthesia for patients undergoing LESS cholecystectomy with no operative or anesthetic conversions, and less postoperative pain at discharge.

One of the most important problems of LC under regional anesthesia is inadequate relaxation of abdominal musculature[12] but this problem was not encountered in our patients.

Our study has limitations in patient selection, but since it was our first venture in the procedure we selected relatively healthier patients without any acute inflammations. But this procedure might be more beneficial to those patients with higher risk for general anesthesia due to the presence of co-morbid conditions.[7]

Conclusion

Our study has provided preliminary evidence about the efficacy of epidural anesthesia for performing LC. This procedure may be more beneficial for high-risk patients for general anesthesia. Shoulder pain may be controlled by using nitrous oxide and local irrigation of diaphragm with anesthetics.

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