



Laparoscopic Cholecystectomy Under Spinal Anesthesia with Low-Pressure Pneumoperitoneum - Prospective Study of 150 Cases

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Received: February 16, 2012
Accepted: March 09, 2012
Arch Clin Exp Surg 2012;1: 224-228
DOI: 10.5455/aces.20120309094124

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Abstract

Objective of study: Laparoscopic cholecystectomy under general anesthesia has attained the status of a gold standard for uncomplicated symptomatic gall stone disease; we therefore performed this study to assess its feasibility under spinal anesthesia with low-pressure pneumoperitoneum. Lower pressures are claimed to be safe and effective in decreasing cardiopulmonary complications and pain.

Materials and Methods: In a private rural medical college, 150 patients were selected prospectively for laparoscopic cholecystectomy, under low-pressure (8mmHg) pneumoperitoneum and under spinal anesthesia over a span of one and a half years. Injection bupivacaine (0.5%) was used for spinal anesthesia. All ports were made in a head-down position to avoid hypotension. Shoulder pain was managed by reassurance as well as by diverting the attention and sedation in a few cases.

Results: We successfully performed the operations in 145 patients without major complications. Spinal anesthesia was converted to general anesthesia in five patients due to severe shoulder pain. Age varied between 21 and 75 years. Duration of operation time (skin to skin) was between 40 and 80 minutes. Twenty-nine patients complained of right shoulder pain. Most of them were managed by reassurance from the anesthetist and a few needed an injection of fentanyl along with midazolam.

Conclusion: Laparoscopic cholecystectomy with low-pressure CO₂ pneumoperitoneum is feasible and safe under spinal anesthesia. Incidence of postoperative shoulder pain and complications are comparable with laparoscopic cholecystectomy under general anesthesia.

Key words: General anesthesia, gall stone disease, laparoscopic cholecystectomy, spinal anesthesia

Introduction

Laparoscopic cholecystectomy under regional anesthesia has been done only for patients who were unfit to receive general anesthesia, and were mainly patients with severe chronic obstructive airway disease.

Regional anesthesia has also been used for laparoscopy in fit patients in combination with general anesthesia for the pain-free postoperative period. Regional anesthesia has not been routinely used as a sole method of anesthesia in laparoscopic proce-

dures due to the assumption that the induction of CO₂ pneumoperitoneum may cause respiratory embarrassment and can also produce discomfort and shoulder pain due to stretching of the diaphragm in patients who are awake during the procedure. There is no doubt that regional anesthesia has been successfully used for laparoscopic cholecystectomy in patients unfit for general anesthesia, but surprisingly, has not been tested in fit patients. Lower pressures are claimed to be safe and effective in decreasing cardiopulmonary complications and shoulder pain. In one report, the hemodynamic changes associated with laparoscopic gas insufflation were described as short-lived and losing significance after 10 minutes [1]. Therefore, we have done this small study to find out the feasibility and safety of laparoscopic cholecystectomy with low-pressure CO₂ pneumoperitoneum under spinal anesthesia alone, in fit patients with uncomplicated symptomatic gallstone disease.

Materials and Methods

The study was conducted in a private rural medical college of northern India, from June 2010 to December 2011. A total of 150 otherwise fit patients (American Society Anesthesiologist Grade 1 and Grade 2) were selected prospectively from the patients with uncomplicated symptomatic gallstone disease, who opted for laparoscopic cholecystectomy. Only 20 patients were between 51 and 75 years of age with ASA Grade 2, and the rest were with ASA Grade 1.

Patients with a history of acute cholecystitis, jaundice, a history of previous upper abdominal operations, ultrasonographic features of an edematous gallbladder wall, aged less than 20 years and having suspicion of gallbladder malignancy were excluded from the study.

A total of 150 patients was planned for laparoscopic cholecystectomy under spinal anesthesia. Spinal anesthesia was converted to general anesthesia in five patients due to severe shoulder pain. Thus, a total of 145 successfully underwent laparoscopic cholecystectomy (LC) under spinal anesthesia. All the patients were admitted on the day before the operation. A verbal consent was taken from all patients and all were told about the possibility of shoulder pain during surgery. Preoperatively, about 500 ml of Ringer's lactate solution was given to all patients to decrease the incidence of perio-

perative hypotension.

Spinal anesthesia was given in a right lateral position with a spinal needle 26 G into the L2 - L3 subarachnoid space. 2ml to 3.5 ml of 0.5% bupivacaine heavy was used depending on the weight and height of the patients. The patient was kept in the right lateral position for a few seconds and then was turned to a supine position with the head end of the table tilted down (Trendelenburg) 15-20° with a pillow under the shoulder. Oxygen saturation and blood pressure were monitored at 5-minute intervals. The incidence of hypotension was managed with extra intravenous fluid infusion and an injection of mephentine (15 mg). The patient was kept in this head-down position for about 5-6 minutes until a block was achieved up to T5 (sensory block). During this phase when the patient was in the head-down position, antiseptic cleaning and draping were completed and pneumoperitoneum was created. Pneumoperitoneum was started at the rate of one L/min. Now the head end of the table was elevated and a right-up position was made (standard position of laparoscopic cholecystectomy). The rate of gas insufflation was increased to two to three L/min. Intra-abdominal pressure was maintained at 8mm of Hg.

Tense gallbladders were aspirated if required. Calot's triangle dissections were made. The cystic duct and artery were clipped proximally doubly. After Calot's dissection, the position of the table was made neutral and the rest of the surgery was carried out with the right up, with the head in a neutral position. In the first fifty cases, we used a harmonic scalpel as dissection energy for removal of the gallbladder. However, in the rest of the 95 patients, further dissections were made by electrocautery using a hook. The gallbladder was removed through the umbilical port in the above-noted table position. The port's repair was done in the head-down position to avoid any hypotension.

If a patient complained of right shoulder pain, he/she was then consoled by the anesthetist and attention was diverted by continuous rubbing over the right shoulder. About 29 (20%) of the patients complained of shoulder pain. Only five patients required an intravenous injection of fentanyl with midazolam for unbearable shoulder pain in addition to a massage. Excessive smoke formation during electrocautery was removed

immediately for better vision and to avoid aggravation of right shoulder pain.

In all the cases, a drain was placed in the hepatorenal pouch, which was removed the next morning. During operation, the pulse rate, blood pressure, respiratory rate, oxygen saturation, shoulder pain, bleeding and any other difficulty were recorded. Operation time, postoperative pain, nausea, vomiting, headaches, wound-related complications, ambulation time and patient satisfaction were also recorded in the postoperative period. Patients were discharged after 72 hours of operation. They were asked to come for the first follow-up visit 8 days postoperatively for removal of stitches.

Results

A total of 150 patients were included in our study. 145 patients underwent laparoscopic cholecystectomy under spinal anesthesia. Age varied between 21 years and 75 years. No morbid obese patients were included in the study (Table 1).

Out of a total of 150 selected patients, five patients

(all females) were converted to general anesthesia due to a severe right shoulder pain not responding to shoulder rubbing and an injection of fentanyl along with an injection of midazolam. Therefore, we ultimately completed the laparoscopic cholecystectomy operations in 145 patients under spinal anesthesia.

Only 29 (20%) of the patients complained of right shoulder tip pain. 24 were managed by reassurance and with diversion of attention (by continuous massaging over the right shoulder area of the patients). Only five patients required an injection of fentanyl along with midazolam for pain relief. Oxygen saturation was maintained around 98-100% without oxygen supplementation. The maximum respiratory rate during pneumoperitoneum was 16 to 36 per minutes (rate was more in patients with shoulder pain). During Calot's dissection, patients were counseled to take quiet breaths.

In most of the patients, blood pressure was maintained at a normal range. Only 8 patients developed hypotension and were managed with an injection of mephentine (15mg). The hypotensive threshold value was 80mmHg. The foot end of the patient's bed was kept elevated for 6 hours in the postoperative period. Ten patients complained of a post-spinal headache, especially where more than one spinal puncture was made. Injections of Emset (ondansetron) and Aciloc (ranitidine) were used to manage nausea and vomiting in the postoperative period. In eighteen patients, the

Table 1: Preoperative characteristic of patients.

Total no. of patients	150
LC under spinal anesthesia	145
Conversion from spinal to general anesthesia	5
Age	21 to 75 years
Sex - male/ female ratio	1:5 (25M: 125F)

Table 2: Clinical findings in the study population.

Lap. cholecystectomy under spinal anesthesia	145
Duration of surgery	40 to 80 minutes
Oxygen saturation maintained	98-100% in all the patients
Adhesions in calot's triangle	in 108 patients (74.48%)
Adhesions of gallbladder	in 94 patients (64.82%)
Shoulder pain during surgery	in 29 patients (20%)
Gallbladder perforation during dissection	in 18 patients (12.41%)
Gall stones spillage	in 10 patients (6.90%)
Bile duct injury	NIL
Bleeding	NIL
Postoperative bile leakage	NIL
Postoperative headache	in 10 patients (6.90%)
Postoperative shoulder pain	in 10 patients (6.90%)
Postoperative nausea/vomiting	in 18 patients (12.41%)
Mild umbilical wound infection	in 22 patients (15.17%)

wall of the gallbladder was perforated, but spillage of stones only occurred in ten patients. Irrigation of the sub-hepatic and sub-diaphragmatic area was done with normal saline along with removal of stones. The duration of operations (skin incision to skin closure) was 40 minutes to 80 minutes (Table 2).

Twenty-two patients complained of mild umbilical wound discharge on the first follow-up. The wound healed up by dressing. All the patients were satisfied with the results of operations on the follow-up.

Discussion

Laparoscopic cholecystectomy is the gold standard for treatment of symptomatic cholecystitis. General anesthesia is regarded as safe anesthesia for laparoscopic surgery. Spinal anesthesia is cheaper than general anesthesia and there is also no incidence of a postoperative sore throat, aspiration, and no chances of failure of intubation. Spinal anesthesia can be useful, even in cholecystitis patients suffering from chronic obstructive pulmonary disease (COPD). Patient monitoring is easier under spinal anesthesia, as patients are awake during surgery. The incidence of postoperative nausea and vomiting is also less with spinal anesthesia [2-13]. Spinal anesthesia is an easier technique than general anesthesia [2].

By preloading with fluids, the incidence of perioperative hypotension can be lessened [12]. To prevent the fall of blood pressure, lowering of the head end of the table for 5-6 minutes immediately after spinal anesthesia, a neutral position of the patient after Calot's triangle dissection, elevation of the foot end of the table during repair of the ports as well as during the postoperative period were done [2,3]. The incidence of hypercarbia producing hypertensive episodes was negligible, as all the patients were operated under low-pressure pneumoperitoneum (8mmHg) [2,3].

Perioperative shoulder pain can be managed by reassurance and by diverting the attention of the patient, diminution of elevation of the head end of the table after Calot's dissection, using low-pressure pneumoperitoneum and a clearing out of smoke due to diathermy at the earliest [13]. Even a local wash of the right diaphragm can be done with 2% lidocaine solution to control the severe shoulder pain, which is uncontrollable with an injection of fentanyl [2]. Even use of a mixture

of hyperbaric bupivacaine and morphine as a spinal anesthetic agent has been reported to reduce perioperative shoulder pain [14]. A lower inflow rate of carbon dioxide (1-2 L) during the initial phase of inflation can lessen the incidence of shoulder pain.

Postoperative shoulder pain can be avoided by near complete evacuation of pneumoperitoneum and by elevation of the foot end of the table [13]. Barczynski et al. used intraperitoneal irrigation of normal saline to reduce the incidence of postoperative shoulder pain [8]. As reported by Gurusamy et al., there was no difference in the mortality, morbidity, or conversion to open cholecystectomy between these two laparoscopic cholecystectomy groups of low pressure (n=336) and standard pressure (n=354). The intensity of pain was also less in the low-pressure group. The incidence of shoulder pain was also lower in the low-pressure group (RR 0.53; 95% CI 0.31 to 0.90). The analgesic utilization was also less. The operating time was similar between the groups (MD 2.30 minutes; 95% CI 0.42 to 4.18) [15]. Tzovaras et al. have reported that the incidence of postoperative shoulder pain is less after laparoscopic cholecystectomy with low-pressure peritoneum under spinal anesthesia [16].

Standard dissection of cholecystectomy using four ports under low-pressure pneumoperitoneum is not difficult, compared to laparoscopic cholecystectomy under general anesthesia with standard-pressure pneumoperitoneum. There was no problem of space availability with low-pressure pneumoperitoneum and the incidence of complications of cholecystectomy is comparable to standard laparoscopic cholecystectomy under general anesthesia.

Conclusion

Laparoscopic cholecystectomy under spinal anesthesia with low-pressure pneumoperitoneum is a safe and cost-effective procedure. Low-pressure pneumoperitoneum appears to be effective in decreasing shoulder pain after laparoscopic cholecystectomy. There is a comparable incidence of complications with minimal postoperative pain.

Conflict of interest statement

The authors do not declare any conflict of interest or financial support in this study.

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