

# Laparoscopic cholecystectomy under spinal anesthesia in high risk patients: A single center experience

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## Abstract

**Aim:** Laparoscopic cholecystectomy is routinely done with general anesthesia except for patients that are considered too sick for general anesthesia. The goal of this study was to investigate the availability, safety, and side effects of spinal anesthesia in laparoscopic cholecystectomy.

**Material and Methods:** Patients with high risk for general anesthesia who admitted for laparoscopic cholecystectomy were given the choice of spinal anesthesia instead of general anesthesia. In Ortadogu Private Hospital, Adana, Turkey; 371 subjects were prospectively admitted for laparoscopic cholecystectomy under spinal anesthesia between January 2015 and January 2018. All volunteers provided informed consent. The spinal anesthesia procedure was done similar to the general anesthesia protocol with no modifications. Intra-abdominal pressure was sustained within the 8-10 mmHg range. A 3.5mL bupivacaine (0.5%)/fentanyl (20 µg) mixture was used for spinal anesthesia. Data collected for demographics, ASA scores, surgery duration, comorbidities, and sedation medication/dosage were reviewed.

**Results:** A total of 232 women (62.6%) and 139 men (37.4%) comprised the study. The subjects averaged 51 years of age (range: 37-89). Patients were classified into the following ASA categories: ASA II: 48 subjects (12.9%), ASA III: 197 subjects (53.1%), ASA IV: 126 subjects (34.0%). Surgery was performed successfully in 371 patients. Spinal anesthesia was adapted to general anesthesia for 2 (0.5%) subjects. The average operation time was 38.1 minutes (range: 16-74 minutes). O<sub>2</sub> saturation was 97.8% on average for all patients. Right shoulder pain was documented in 14.5% of the patients, and a shoulder massage alleviated the discomfort in most subjects.

**Conclusions:** Spinal anesthesia should be the anesthesia of choice due to its numerous advantages in high-risk patients related to general anesthesia.

**Keywords:** Laparoscopy; Cholecystectomy; Spinal Anesthesia; Gallstone Disease; Regional Anesthesia.

## INTRODUCTION

Laparoscopic cholecystectomy (LC) has been the recommended surgical option of choice for gallbladder disease (1). LC is usually performed under general anesthesia (GA). Similar to GA, spinal anesthesia (SA) can provide localized analgesia to a conscious patient. Some of the advantages include low levels of discomfort, reduced hospital time (post-surgery), and shortened recovery time (2-5). Regional anesthesia has gained acceptance in patients that are at high risk during GA (6-8). At our healthcare facility, we have had successful open abdominal procedures under SA since 2007. After performing minimal access surgical procedure, we shifted to SA for LC. We completed the operations using low-pressure pneumoperitoneum to avoid excessive

stretching of the diaphragm and to lower the hypercarbia complication rate.

This prospective study was conducted to prove the effectiveness and feasibility of spinal anesthesia for LC in high-risk patients.

## MATERIAL and METHODS

This study was conducted at our clinic during the period from January 2015 to January 2018. At the same period, 1396 laparoscopic cholecystectomy was performed in our hospital and 371 subjects were prospectively admitted for laparoscopic cholecystectomy under spinal anesthesia. Written approval was obtained from Local Clinical Ethical Board and approval number was 2018/271. Informed consent was obtained from all patients. Volunteers have

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educated the LC under SA procedure risks/secondary effects. Inclusion criteria were symptomatic gallbladder stones in ASA II-III-IV patients. Exclusion criteria were patients with gallbladder malignancy, previous abdominal open surgeries, coagulation disorders, body mass index >51, and spinal deformity. The same surgical and anesthesiology team performed all LC cases.

Catheterization (intravenously in the left hand) was performed, and an antibiotic (cefazolin) was administered. Subsequently, a routine spinal puncture was conducted in the middle of L1 and L2 interspace while the patient was in the seated position and 3.5 mL mixture of heavy bupivacaine (0.5%)/fentanyl (20 µg) was injected intrathecally. Anesthesia level was checked with pin-prick sensation, and the procedure was started with a T4 dermatome sensory block.

During surgery, patients were given the option of oxygen supplementation and were mandatory for patients with SPO2 less than 95%. Anxiety, pain, hypotension, and bradycardia were treated with midazolam (1 mg), fentanyl (50 µg), noradrenaline (2 mg), and atropine (50 µg), respectively. Ephedrine (10 mg) was administered when the mean arterial blood pressure declined below the pre-anesthetic value (greater than 20%).

Operative time, duration of anesthesia, and all patient symptoms were recorded.

The standard laparoscopic technique was applied with the placement of 3 trocars and on occasion four trocars. Pneumoperitoneum was generated with a Veress needle and a maximum intra-abdominal CO<sub>2</sub> pressure of 10 mmHg. The gallbladder fundus was gripped with a grasper via the lateral cannula. Dissection of the gallbladder and exteriorized was done via the 10-mm sub xiphoid passage and calculi were excised. No patient needed an nasogastric (NG) tube.

Postoperatively, all subjects were administered intravenous 5% dextrose for 24 h, 100 mg ketoprofen (8 h), and 500 mg paracetamol (6 h). Pain assessment was done using VAS at (2, 4, 6, and 12 h). All surgery/anesthesia-related symptoms were also documented during this time. Patients were given a meal at six h post-operation and released 24 h later. In some cases, patients with chronic obstructive pulmonary disease (COPD), coronary heart disease, and ASA IV were hospitalized longer.

### Statistical method

The SPSS 17.0 packet program was used to analyze the data. Categorical measurements were summarized as numbers and percentages, and continuous measurements were summarized as means and standard deviations.

## RESULTS

A total of 371 patients with cholelithiasis (139 males and 232 females) were consented to undergo LC under SA. The demographic distribution is in Table 1. The operation was completed laparoscopically in all patients. In 2 patients, SA was changed to GA because of shoulder pain

in 1 patient and unclear anatomy in 1 patient. SA-related complications are shown in Table 2. No standard method of drug usage was used, and sedation depth was recorded based on the Ramsay Sedation Scale (9). Drug usage details are shown in Table 3.

**Table 1. Epidemiologic parameters**

Parameters	(n=371)
Age	51 (37-89) years
Male	139
Female	232
Emergency (acute cholecystitis)	73 (19.3%)
Elective	298 (78.6%)
ASA 2	48 (12.7%)
ASA 3	197 (52.0%)
ASA 4	126 (33.2%)
Diabetes Mellitus	87 (23.0%)
Hypertension	96 (25.3%)
Atherosclerotic heart disease	36 (9.5%)
COPD	120 (31.7%)
Obesity	25 (6.6%)

**All patients had detailed preoperative evaluation and preparation for surgery**

**Table 2. Spinal Anesthesia-Related Complications**

Complications	n=371
<b>Perioperative</b>	
Neck/Shoulder pain	54 (14.2%)
Hypotension (20% fall)	21 (5.5%)
Anxiety	15 (4%)
Conversion to GA	2 (0.5%)
Bradycardia	4 (1.1%)
<b>Postoperative</b>	
Headache	6 (1.6%)
Urinary retention	5 (1.3%)
Vomiting	1 (0.3%)

**Table 3. Sedation**

Drugs	Mean doses	n
Midazolam (mg)	2.35 ±0.49	23(6.2%)
Fentanyl( µg)	35.32 ±7.73	31(8.3%)
Number of patients		54 (14.5%)

Patients with pain in their right shoulder were given a continuous finger massaging by a nurse or anesthesia technician over the right shoulder areas. Only 54 patients required an injection for sedation. In these patients, oxygen saturation was maintained around 98% with O<sub>2</sub> supplementation, and the mean was respiratory rate 22.5 (range 15-38).

Following sedation, patients were given oxygen and the mean time of operation was 38.1 minutes, (range:

16-74). LC was performed according to the 3-trocar technique; in 28 cases, the 4-trocar technique was used. Cardiopulmonary complications were minimal except for hypotension in 21 (5-6%) subjects.

Five (1.3%) patients had urinary retention that required catheterization. A postural headache was seen in 6 (1.6%) cases and were treated by lying down with increased fluid intake/caffeine. Overall, 40.1% (152) and 63.9% (242) subjects needed diclofenac postoperatively for abdominal pain after 2 hours and 24 hours, respectively.

The mean body mass index (BMI) of the patients was  $32.44 \pm 4.13$  (range 26-51). There were 25 obese patients and their mean BMI was  $44.76 \pm 2.65$  (range 41-51).

Patients who had COPD, coronary heart disease and ASA IV were discharged two days after the surgery. All other patients were discharged one day later. The mean time for release was 1.6 days.

All patients reported high satisfaction and would endorse SA for LC.

## DISCUSSION

LC is the treatment of choice for cholelithiasis. SA is still limited to patients unfit for GA in LC (6). Single puncture SA can be easier to accomplish than GA (10). A lower hyperbaric bupivacaine (7.5 mg)/fentanyl (20 µg) dose can provide adequate anesthesia for LC (11). Additional reasons for the preference of SA were reduced complications and faster recovery time compared to GA (12,13).

In this report, low-dose SA and maintenance of an intraperitoneal pressure of around 8-10 mmHg did not involve modifications to the method. Hemodynamic variability can occur with pneumoperitoneum in patients with cardiopulmonary dysfunction (14). The circulatory system can be affected and depends on the pressure that is created (15). A pressure of 8-12 mmHg upon pneumoperitoneum has been reported to be safe for LC patients (14,16). We created the pneumoperitoneum pressure of 10 mmHg in our patients.

One major problem associated with LC under SA is a pain the right shoulder (3,4,10,11). Right shoulder pain is most likely caused by diaphragm irritation following CO<sub>2</sub> pneumoperitoneum. In this report, 54 subjects (14.5%) had shoulder pain. Kalaivani et al. (17) cited shoulder pain in 24% and Yüksek et al. (10) reported 50% in their patients, respectively. In our study, conversion from spinal anesthesia was required in 1 (0.2%) cases because of severe shoulder pain regardless of sedation. The change from SA to GA because of severe shoulder pain has been described as ranging from 7%-43% (4,13,17). Yüksek et al. (10) performed LC under SA in 26 patients, and three patients (11.5%) needed GA due to the shoulder pain severity. In the series by Tiwari et al. (13), four out of 114 cases (3.6%) under SA were changed to GA. In another study by Sinha et al. (4), four the change to GA was 0.52% (18 cases). Kalaivani et al. (17) reported 8% of patients

converted to GA. In our series, one patient was switched to GA because of unclear anatomy due to dense adhesion. No patient was turned to GA and open surgery.

Intraoperative hypotension is another problem in LC under SA (2,4,11). Hypotension occurred in 21 (5.6%) patients, agreeing with reported rates of 14.2-41.1% (4,11,18). Hypotension can be overcome by preloading fluids, and ethylephrine was used for treatment.

Patients were fully conscious during surgery under spinal anesthesia. Respiration rate was increased to washout carbon dioxide (4,10). Here, as we reported under low-pressure (10 mmHg) pneumoperitoneum, hypercarbia-produced hypertensive episodes were negligible. In the study by Sinha et al. (4), no patient had PaO<sub>2</sub> or PaCO<sub>2</sub> variations while under SA.

In our cases, intraoperative blood gas analyses were performed for patient's respiratory complications (i.e., obesity, COPD, and ASA IV). In 120 patients who had COPD, we performed LC under SA. In these patients, we administered adequate oxygen by a facial mask to prevent respiratory acidosis. No pulmonary impairments were observed in COPD patients. Taspinar et al. (19) reported a case who had acute cholecystitis with severe pulmonary disease and who underwent LC under combined spinal-epidural anesthesia, and no complication was reported. Savas et al. (8) conducted a study showing that in patients who had a severe pulmonary impairment, regional anesthesia can be an alternative to general anesthesia. Several studies (7,20) conducted that LC with a regional anesthesia in severe COPD patients could be performed safely.

Anesthesia management is problematic in obese patients, and the airway of these subjects should be monitored due to the increased risk of aspiration. We had 15 subjects with a body mass index of 30-45. No patient developed aspiration of gastric content and subsequent respiratory complications.

Postoperative urinary retention and spinal headache are undesirable events related to regional anesthesia. The incidence of postoperative urinary retention was reported between 0.41% and 10% (4,5). In our study, five patients (1.3%) suffered from urinary retention. These patients were managed with urinary catheterization, and the urinary catheter was removed within 2 hours. It was reported that a spinal headache may last up 2.6 days (mean) and may delay the discharge time (4). In our series, six patients (1.6%) suffered from a headache related to SA. An additional 1 L of isotonic saline and caffeine was sufficient for treatment and did not delay the discharge time.

The other notable spinal anesthesia-related problem that we observed was anxiety and discomfort, which was managed by sedation; however, 15 (4%) patients also needed medication. No patient was converted to GA due to distress and anxiety, whereas Sinha et al. (4) reported conversion to GA in 10 (0.29%) patients.

Some surgeons favor high pressure (14 mmHg), whereas some prefer lower pressures (4,5,10,18). In this report, ten mmHg was selected to minimize irritation of the diaphragm. SA gave sensorial and motor suppression that reduced the need for muscle relaxers, which are routinely used with GA.

Postoperative VAS 2 hours, 4 hours, 6 hours, 12 hours was 0.00, 0.45±0.73, 3.29±1.14, 3.51±1.14 respectively. Kalaivani et al. (17) reported that subjects in the SA cohort had lower pain scores in the first 24h in comparison with the GA cohort. Earlier studies (4,5,13) have shown LC done under SA results in significantly less early operative pain and analgesic requirement in contrast to LC under GA.

## CONCLUSION

LC under SA by an experienced surgeon in high-risk patients related to GA is a feasible and low complication procedure that has minimal pain, discomfort, and short recovery time.

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