Laparoscopic cholecystectomy under continuous spinal anesthesia in an elderly patient with respiratory disease: A Case Report

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ABSTRACT

Laparoscopic cholecystectomy under continuous spinal anesthesia in an elderly patient with respiratory disease: A Case Report

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The aim of this case report is to demonstrate the efficacy and safety of Continuous Spinal Anesthesia (CSA) in an elderly patient with severe Chronic Obstructive Pulmonary Disease (COPD), who was scheduled for elective laparoscopic cholecystectomy.CSA can be used to provide a sufficient block in order to allow laparoscopic cholecystectomy to be performed even in patients with severely abnormal respiratory function. Safety, efficacy and a decreased need for postoperative analgesia render this approach a valid option for patients with symptomatic gallstone disease, who are poor candidates for general anesthesia due to cardiorespiratory or airway problems as well as for patients with other contraindications for general anesthesia.

INTRODUCTION

Continuous Spinal Anesthesia (CSA) is a method as old as the technique of spinal anesthesia itself, it is not so popular in modern practice due to the same complications as those associated with single-shot spinal anesthesia, and specific complications, such as postdural puncture headache, or cauda-equina syndrome. CSA has been used in patients undergoing cardiac, vascular, orthopedic and general surgery and in patients with respiratory failure[1]. Laparoscopic cholecystectomy (LC) is usually performed under general anesthesia, although regional anesthesia has been applied both in healthy and in high risk patients, mainly in those with severe respiratory disease. Several

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regional techniques (thoracic epidural, paravertebral block, segmental spinal anesthesia) are possible. However, there are still concerns about their safety and efficacy, as sufficient data are lacking[2,3]. We report a case of an elderly patient with severe Chronic Obstructive Pulmonary Disease (COPD), who was scheduled for elective laparoscopic cholecystectomy for recurrent episodes of acute cholecystitis. Anesthesia was performed using continuous spinal anesthesia in lower lumbar region (L_3-L_4).

CASE REPORT

After obtaining written informed consent a male patient [77 yrs, ASA IV, body mass index (BMI) 24] who had been a heavy smoker for fifty years and had COPD (severe emphysema), was scheduled for elective laparoscopic cholecystectomy. He suffered from frequent respiratory infections, required continuous oxygen therapy at home and pulmonary function tests showed a severely obstructive pattern. Patient's preoperative spirometric findings are shown in Table 1.

Arterial (radial sample) blood gas analysis (on air) showed that the patient had a pCO_2 in the upper limits which was fully compensated with chronic metabolic alkalosis and moderate hypoxemia for his age which was improved after preoperative intensive bronchodilator therapy for seven days and respiratory exercise. Patient's preoperative respiratory parameters are shown in Table 2.

Table 1. Patient's preoperative spirometric findings

Variables	Measured (L)	% predicted
FVC	1,83	56%
FEV_1	0,53	21%
FEV_1/FVC	0,29	39%
PEF25-75	0,27	10%

FVC: Forced Vital Capacity, FEV_1: Forced Expiratory Volume (1^{st} sec), PEF 25-75: Peak Expiratory Flow between 25-75 sec.

Table 2. Patient's preoperative respiratory parameters.

Variables	Before bronchodilator therapy and respiratory exercise preoperatively	Before surgery
pH	7.45	7,44
$PaCO_2$	45	44
PO_2	59	70
HCO_3	31,2	30,6
BE	6,2	5,9
SpO_2	89%	95%

$PaCO_2$: arterial carbon dioxide partial pressure, PO_2 :arterial oxygen partial pressure, BE: Base Excess

Preoperative evaluation concerning other coexisting diseases showed arterial hypertension with right cardiac failure under treatment.

He suffered recurrent episodes of acute cholecystitis for the last two years resulting in a ten Kg weight loss during this period. The patient's respiratory state raised considerable anesthetic concerns and surgery was denied at two other hospitals before he was referred to our hospital. Extensive gastrointestinal evaluation by endoscopy and imaging excluded other intra-abdominal pathology.

After considering the options and discussing them with both the patient and the surgeon, a decision was taken to proceed to an elective laparoscopic cholecystectomy using continuous spinal anesthesia–analgesia. No premedication was given. On patient's arrival on the operating room, after establishing noninvasive monitoring (ECG, NIBP, SPO_2), a radial artery was cannulated to monitor blood pressure continuously and also to obtain regularly blood gases sampling.

Prehydration was achieved using 500 ml of Ringer's Lactate (R/L) solution. Before anesthesia induction, 50 mg of ranitidine hydrochloride and 4 mg of ondasetron was given to the patient and a nasogastric tube was also inserted. He was then positioned at the right lateral decubitus position and a 19G Tuohy needle (pediatric 19G-5cm, Portex®) was inserted into the subarachnoid space at the L_3-L_4 intervertebral space. The epidural needle was inserted without discomfort and once free flow of cerebrospinal fluid (CSF) was obtained, an epidural catheter was then inserted leaving 4 cm in the epidural space. The catheter was taped to the back of the patient who was then placed supine.

A total amount of 12 mg heavy bupivacaine and 30 μg fentanyl was administered intermittently through the catheter, at 5 min intervals and after checking the sensor blockade. After 20 min a sensory (pinprick) block, extending between the T_5 and L_2 dermatomes was obtained without a hint of respiratory distress or severe cardiac instability. The surgery started, carbon dioxide was insufflated slowly at 1-2 lt/ /min to avoid stimulating the vagal nerve and causing bradycardia. A low pressure pneumoperitoneum (cut-off 10 mmHg) was created in order also to minimize patient's discomfort. Patient reported a mild shoulder pain that responded well to 25 μg fentanyl intravenously.

The initial blood pressure (BP) prior to surgery was 140/75mmHg, heart rate (HR) 68/min and a 500 ml of R/L was infused. After 20 min from spinal anesthesia, BP decreased to 95/60 mmHg and HR 58/min. The hypotension responded well to 5 mg ephedrine bolus and an ephedrine solution of 120μg/ml, at a rate 60 ml/h, was administered for ten minutes in order to stabilize blood pressure without the need of repeated bolus doses. After that, blood pressure remained stable during the operation. The respiratory profile at baseline (prior to surgery) and after carbon dioxide insufflation is shown

in table 3. The patient remained calm and comfortable during the procedure. The patient also received oxygen 3-4 lt/min via nasal catheters during surgery (SpO_2 perioperatively 100%).

Table 3. Changes in perioperative respiratory parameters.

Variables	Baseline (air)	30 min after CO_2 insufflation	60 min postoperatively
pH	7,44	7,41	7,42
$PaCO_2$	44	47	47
PO_2	70	228	215
HCO_3	30,6	29,8	30,1
BE	5,9	5,2	5,1
SpO_2	95%	100%	100%

$PaCO_2$: arterial carbon dioxide partial pressure, PO_2 :arterial oxygen partial pressure, BE: Base Excess

The operation was performed with a classic four trocar technique, with minimal table tilting and completed in 70 min due to the presence of adhesions, the chronic inflammatory reaction at the Calot's triangle and, subsequently, the difficult dissection. At the end of the surgery, 0.1 mg morphine was administrated intrathecally for postoperative analgesia. The level of sensory block at the end of surgery was at T6 dermotome. The patient was transferred to postanesthesia care unit and he stayed there until he achieved Aldrete score≥9. The patient was given also 1gr paracetamol every 8h postoperatively. Patient was free of pain (visual analogue scale score 0/10) at 1h, 8h, 16h and 24h postoperatively and no additional analgesic were given. The catheter was removed the second postoperative day and the patient was discharged from the hospital without any sequelae, three days after the procedure.

DISCUSSION

Laparoscopic cholecystectomy under regional anesthesia alone has been reported only occasionally in the past; these reports included patients unfit to receive general anesthesia, mainly patients with severe chronic obstructive airway disease[1,2]. There is no clear indication that regional anesthesia is preferable to general anesthesia for patients with chronic obstructive pulmonary disease (COPD). With respect to postoperative pulmonary complications, the opinions vary[4-7]. In addition, there is no information regarding the degree of pulmonary function abnormality at which the morbidity and mortality risks would outweigh the benefits of elective surgery.

This case shows that the continuous spinal anesthesia, applied in lower lumbar region and with a small dose of local anesthetic can be used to provide a sufficient block to allow laparoscopic cholecystectomy to be performed, even in a patient with severely abnormal respiratory function. One of the feared complications of performing laparoscopic abdominal

surgery is the negative effect of carbon dioxide pneumoperitoneum on lung respiratory function[8,9]. Mechanical ventilation and upper abdominal surgery both have adverse effects on respiratory mechanics (Functional Residual Capacity, Vital Capacity, Tidal Volume, Closing Capacity). Furthermore, it has been shown that patients with COPD are at risk of developing pulmonary complications after upper abdominal surgery[10,11]. Therefore, these patients may benefit from laparoscopic surgery performed under spinal anesthesia. A number of other regional techniques (thoracic epidural, paravertebral block, segmental spinal anesthesia) are also possible[2,12]. In this case the procedure was performed with low-pressure pneumoperitoneum which was maintained with carbon dioxide at 8-10mmHg. Recent studies demonstrate that laparoscopic cholecystectomy with low pressure pneumoperitoneum with carbon dioxide can be safely performed under spinal anesthesia[13,14]. Moreover, laparoscopic cholecystectomy with low pressure carbon dioxide pneumoperitoneum is effective in patients with COPD, who are not good candidates for general anesthesia[8, 15]. The anesthesiologist has a handful of neuraxial techniques to pull from their armamentarium. Each of these has their own unique set of advantages and disadvantages for clinical application with some specific issues with regard to risk of the particular techniques. Spinal continuous anesthesia has some undoubtedly advantages such as a longer duration of effect, small doses of local anesthetics, excellent motor block, good reliability, provide greater hemodynamic stability than single-injection spinal anesthesia because of ability to titrate dose slowly. However, the incidence of specific complications such as infection, postdural puncture headache or cauda-equina syndrome, remains controversial[16, 17].

CSA in the lower lumbar area was chosen because of personal familiarity with a highly reliable technique, which can provide profound block and good quality analgesia thereafter, avoiding complications attributable to other techniques, or spinal anesthesia in a higher lumbar or thoracic level[12].

We also have demonstrated that laparoscopic cholecystectomy not only is feasible under spinal anesthesia but also decreases the need for postoperative analgesia. Pain following laparoscopic cholecystectomy is not a major problem but it has been a matter of interest in several studies during the last few years. Several researchers have tested intraperitoneal instillation or aerolization of local anesthetic agents, use of anti-inflammatory cyclooxygenase-2 (COX-2) inhibitors, addition of epidural analgesia and oral or epidural administration of steroids, finding some effect on postoperative pain, which varies between studies[18,19]. In a randomized trial, epidurals combined with general anesthesia have been found to be more effective

in lessening postoperative pain in healthy patients compared with general anesthesia[16]. This approach should be considered as a valid option for managing acute pain after laparoscopic cholecystectomy, as a small amount of morphine intrathecally can satisfactory control postoperative pain.

Clearly, patients receiving this technique must be assessed very carefully and each case should be evaluated independently with regard to relative risks and a better cost-benefit ratio. However, as shown in this case report, CSA may guarantee a combination of minimal side-effects and clinical efficacy. As there is never an "ideal'' way to anaesthetize such a patient, CSA could be offered as an option in individualized patients who are not good candidates for general, single shot spinal or epidural anesthesia, provided the involved medical team is fa-miliar with its use, effectiveness and possible side-effects.

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Author Disclosures:

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