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□ Case Report □

Laparoscopic cholecystectomy performed under regional anesthesia in patient who had undergone pneumonectomy

— A case report —

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Seventy-one years old, ASA physical status III, male patient underwent laparoscopic cholecystectomy due to acute cholecystitis with gall bladder (GB stone). He had undergone right pneumonectomy nine years ago. Moderate obstructive and restrictive pattern was found on PFT and hypokinesia of apical anterior and septum segments was seen on echocardiography. Due to patient's refusal of receiving general anesthesia, we decided to perform regional anesthesia. Epidural catheter was inserted at 10th thoracic intervertebral space and segmental spinal anesthesia was performed at L2-L3 intervertebral space with 5 mg of hyperbaric bupivacaine 0.5% and 20 ug of fentanyl. A segmental sensory block, extending from T3 through L2 dermatomes, was obtained. Surgery was performed smoothly and uneventfully. Patient discharged from hospital at 3 days after surgery. **(Korean J Anesthesiol 2009; 56: 330～3)**

Key Words: Laparoscopic cholecystectomy, Pneumonectomy, Regional anesthesia.

INTRODUCTION

Laparoscopic cholecystectomy has become firmly established as the method of choice for the treatment of asymptomatic gallstone because of obvious advantages of minimally invasive character of the procedure associated with less pain, reduced hospital stay, and earlier return to daily activities. The procedure usually necessitates general anesthesia and endotracheal intubation to prevent aspiration and respiratory difficult due to the pneumoperitoneum.

Nevertheless, regional anesthesia can be considered as a valid option for patients with biliary colic who are poor candidates for general anesthesia due to cardiopulmonary problems [1-3]. There are sporadic references about cholecystectomy under epidural anesthesia or spinal anesthesia for special patients such as pregnant woman or patients with chronic obstructive airway disease with high risk for general anesthesia [4-8].

Segmental spinal anesthesia can be used as alternative anesthetic method for cholecystectomy in patients with cardiopulmonary problems [9,10]. Therefore, we report our successful experience of segmental spinal anesthesia for cholecystectomy.

CASE REPORT

Seventy-one years old male patient (168 cm, 56 kg) diagnosed as acute cholecystitis with GB stone was admitted for laparoscopic cholecystectomy. He was taking medication for benign prostate hypertrophy and had undergone right pneumonectomy 9 years ago (Fig. 1). Although there was no problem in carrying out daily life, he complained of dyspnea on minimal extent of exercise. He had a smoking history of 25 pack year. Preoperative chest CT found focal pneumonia on left upper lobe. Pulmonary function test showed moderate obstructive and restrictive pattern (Fig. 2) and the result of ABGA was as follow; pH 7.35, $PaCO_2$ 42 mmHg, pO_2 65 mmHg, and SaO_2 93%. Abnormal findings such as LVH, APCs, and VPCs were found on his EKG. Echocardiography reported global hypokinesia at LAD territory with mild LV systolic dysfunction

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Fig. 1. Chest PA of the patient. He had undergone right pneumonectomy.

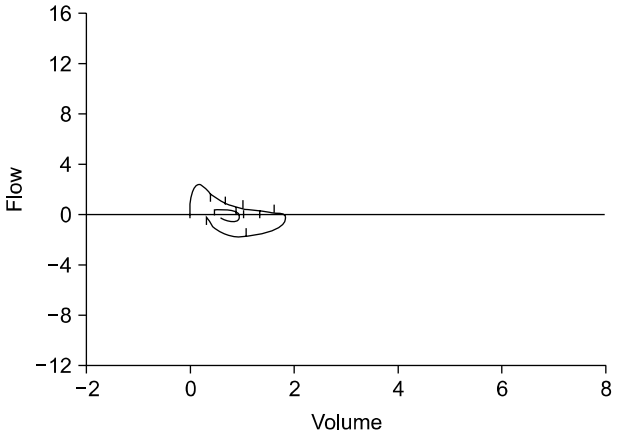

Fig. 2. Pulmonary function test of the patient. Moderate obstructive and restrictive pattern was found on pulmonary function test.

(ejection fraction: 48%). There were no abnormal findings on preoperational blood test except for the leukocytosis (neutrophil 90%) and increased direct billirubin (0.7 mg/dl). Pulmonology consultation reported that there was moderate postoperative risk and that it could be fatal if post-op pneumonia would develop. On cardiology consultation, postoperative risk was 1−5% based on modified Goldman cardiac risk criteria. If the surgery was to be performed under general anesthesia, severe postoperative complications could be anticipated. Thus, we decided to take segmental spinal anesthesia after discussing the options with the patient and his guardians.

The patient was given 7.5 mg midazolam orally one hour before surgery. On patient's arrival at the operating room, noninvasive monitoring (ECG, arterial blood pressure and pulse oximetry) started. An intraarterial cannulation was performed after 1% lidocaine infiltration for direct blood pressure monitoring and blood sampling. After obtaining baseline vital signs, oxygen was administered at 3 L/min through a face mask. The patient was placed right lateral decubitus position. After infiltration of 2% lidocaine, a 17-gauge epidural needle was introduced at the 10th thoracic interspace and an epidural catheter was inserted for incomplete spinal anesthesia and post-operative pain control. After a confirming the catheter position by injecting test dose (3 ml of 1.5% lidocaine with 1 : 200,000 epinephrine), a 25-gauge pencil-point spinal needle was introduced into the subarachnoid space at the L2-L3 intervertebral space. After confirming free flow of cerebrospinal fluid, 5 mg of hyperbaric bupivacaine 0.5% and 20 ug of fentanyl were injected intrathecally toward the cephalad direction at the velocity of 0.1 ml/sec. Then, after keeping the patient in the 15° Trendelenberg position for five minutes, the patient was replaced to a supine position. Approximately 10 minutes after intrathecal injection, the level of analgesia was checked. During this period, 500 ml of 0.9% normal saline was infused. A segmental sensory (pin-prick) block, extending between T3 and L2 dermatomes, was obtained without any motor weakness in the lower legs or respiratory distress. Blood pressure decreased from 135/79 mmHg to 87/59 mmHg and heart rate decreased from 89 beats/min to 67 beats/min without nausea, vomiting, or chest discomfort. Hypotension and bradycardia responded well to intravenous injection of ephedrine 10 mg; Blood pressure increased to 118/65 mmHg and heart rate increased to 79 beats/min, and no further medication was administered. Patient was monitored continuously during the operation by both clinical observation and close hemodynamic monitoring (ECG, heart rate, arterial blood pressure, respiratory rate, pulse oximetry, arterial blood gas, and BIS). All data were recorded at 5 minute intervals, except for arterial blood gas (15 minute intervals) (Table 1, 2). An intravenous midazolam 0.05 mg/kg was administered to relieve anxiety. At this dose, the drug has a mild hypnotic and sedating effect and enables the patient to continue breathing spontaneously.

Surgery was performed smoothly and uneventfully using a three-trocar technique. A Verres needle was used to create a pneumoperitoneum; carbon dioxide (CO_2) was insufflated to an intraabdominal pressure of 10 mmHg instead of the usual 14

Table 1. Arterial Blood Gas Analysis during Perioperative Period

	pH	PCO_2 (mmHg)	PO_2 (mmHg)	SaO_2 (%)
Pre-op	7.36	42	67	93
15 min after induction	7.39	42	218	99
30 min after induction	7.29	54	277	99
45 min after induction	7.35	42	215	98
At recovery room	7.36	42	157	98

The patient received oxygen 3 L/min through a face mask during the operation and throughout the recovery period.

Table 2. Changes of Arterial Blood Pressure, Heart rate and BIS during Perioperative Period

	SBP/DBP (mHg)	HR (beats/min)	BIS
Pre-op	135/79	89	95
1 min after induction[a)]	87/59	67	94
3 min after induction	118/65	79	94
5 min after induction	117/68	81	94
10 min after induction	124/74	84	94
20 min after induction	125/76	86	82
30 min after induction	120/81	84	75
At recovery room	132/76	85	89

Midazolam was administered at 15 minutes after induction.
BIS: bispectral index score, [a)]the time to intravenous injection of ephedrine 10 mg.

mmHg. To avoid stimulating the vagal nerve and causing bradycardia, the CO_2 was insufflated slowly at 2 L/min using the low-flow setting of the insufflator (Karl Storz, Buenos Aires, Argentina). Another modification of the technique was the minimal, if any, tilting of the operating table - that is, head up, left tilt in order to minimize diaphragmatic irritation. Operation time was 45 min. and no other incidents such as discomfort, nausea, vomiting, shoulder pain, headache and neurologic sequelae was developed during peri-operative period. A continuous epidural infusion of bupivacaine 1.25 mg/ml with fentanyl 2 ug/ml was started at 5 ml/h at the arrival of recovery room. Patient was orally fed the morning after the operation and discharged from hospital on day 3.

DISCUSSION

Laparoscopic cholecystectomy was first introduced by Phillipe Mouret in 1987 and is now generally performed by many surgeons [11,12]. Unlike previous open surgery, this procedure requires only very little incisions and has benefits such as less pain and shorter hospital stay due to less tissue damage, and swift return to everyday life due to fast recovery [13]. However, considerable difficulties in anesthetic management could be encountered since wide hemodynamic fluctuation may develop due to pneumoperitoneum and position changes during the operation. Also, serious complications such as tissue damage or air embolism could occur.

Laparoscopic cholecystectomy is classically performed under general anesthesia; there are only sporadic references in the literature about regional anesthesia being used in special cases at high risk to undergo general anesthesia [4,5].

Laparoscopic cholecystectomy done under spinal anesthesia may have several advantages over laparoscopic surgery done under general anesthesia [14]. This report shows that laparoscopic cholecystectomy can be successfully operated in patients with cardiopulmonary disease through spinal anesthesia technique at lumbar level. The biggest problem of spinal anesthesia for laparoscopic cholecystectomy is spinal cord damage by puncturing at the thoracic level. An accidental performance of spinal anesthesia at a higher level than the intended one (L2-L3) can result in spinal cord damage [15]. Thus, we performed spinal anesthesia was at lumbar level (L2-L3) and the patient was kept in trendelenburg position for few minutes in order to achieve adequate extent of blockade required for the surgery. In addition, for the case of unsuccessful anesthesia and for postoperative pain control, we inserted epidural catheter at thoracic level prior to performing spinal anesthesia. In our case, epidural catheter was used only for post-operative pain control since adequate anesthesia was achieved through 5 minutes of trendelenburg positioning.

Another problem is the possibility of inadequate ventilation due to extensive thoracic nerve block. The main inspiratoty muscle, diapragm, will be unaffected because it is innervated from cervical level, and expiration is normally a passive phenomenon. However, forceful expiration and coughing will be affected because they are generated primarily by the muscles of the anterior abdominal wall which are innervated by the thoracic nerve [16,17]. Use of inadequate dose of local anesthetics can produce disastrous effects in patients with obstructive airway disease which depends on active expiration in maintaining lung ventilation. Thus, the degree of nerve block and muscle weakness should be minimized by using adequate dose of local anesthetics.

Another concern is careful control of the pneumoperitoneal pressure during surgery to ensure adequate diapragmatic

excursion. Because pneumoperitoneum by CO_2 insufflation can stimulate vagal nerve and cause bradycardia, CO_2 must be insufflated slowly, and the maximum intraabdominal pressure should be lowered than 14 mmHg. In our patient, intraabdominal pressure was maintained around 9 mmHg.

It seems regional anesthesia may be alternative method to general anesthesia for laparoscopic cholecystectomy in patients with cardiopulmonary disease. As a regional anesthetic technique, other methods such as thoracic spinal, thoracic epidural, combined thoracic spinal & epidural, etc. could be performed. However, considering complications such as spinal cord damage or extended thoracic nerve block, we took segmental spinal anesthesia after the placement of epidural catheter.

According to our experience, laparoscopic cholecystectomy was carried on to 10 patients with segmental spinal anesthesia at lumbar level, and the results were excellent without severe complications. However, more cases should be performed in order to prove its safeness.

REFERENCES

1. Savas JF, Litwack R, Davis K, Miller TA. Regional anesthesia as an alternative to general anesthesia for abdominal surgery in patients with severe pulmonary impairment. Am J Surg 2004; 188: 603-5.
2. Grass JA. The role of epidural anesthesia and analgesia in postoperative outcome. Anesthesiol Clin North America 2000; 18: 407-28.
3. Nakashima H, Ueo H, Karimine N, Asoh T, Mori M, Akiyoshi T, et al. The feasibility of epidural anesthesia without endotracheal intubation for abdominal surgery in patients with collagen diseases. Hepatogastroenterology 1997; 44: 121-6.
4. Pursani KG, Bazza Y, Calleja M, Mughal MM. Laparoscopic cholecystectomy under epidural anesthesia in patients with chronic respiratory disease. Surg Endosc 1998; 12: 1082-4.
5. Gramatica L Jr, Brasesco OE, Mercado Luna A, Martinessi V, Panebianco G, Labaque F, et al. Laparoscopic cholecystectomy performed under regional anesthesia in patients with chronic obstructive pulmonary disease. Surg Endosc 2002; 16: 472-5.
6. Kim YI, Lee JS, Jin HC, Chae WS, Kim SH. Thoracic epidural anesthesia for laparoscopic cholecystectomy in an elderly patient with severely impaired pulmonary function tests. Acta Anaesthesiol Scand 2007; 51: 1394-6.
7. Sulemanji DS, Dönmez A, Arslan G. Epidural anaesthesia for laparoscopic cholecystectomy in a patient with scleroderma. Br J Anaesth 2006; 97: 749.
8. Tzovaras G, Fafoulakis F, Pratsas K, Georgopoulou S, Stamatiou G, Hatzitheofilou C. Laparoscopic cholecystectomy under spinal anesthesia. Surg Endosc 2006; 20: 580-2.
9. van Zundert AA, Stultiens G, Jakimowicz JJ, van den Borne BE, van der Ham WG, Wildsmith JA. Segmental spinal anaesthesia for cholecystectomy in a patient with severe lung disease. Br J Anaesth 2006; 96: 464-6.
10. van Zundert AA, Stultiens G, Jakimowicz JJ, Peek D, van der Ham WG, Korsten HH, et al. Laparoscopic cholecystectomy under segmental thoracic spinal anaesthesia. Br J Anaesth 2007; 98: 682-6.
11. Vecchio R, MacFayden BV, Palazzo F. History of laparoscopic surgery. Panminerva Med 2000; 42: 87-90.
12. Spaner SJ, Warnock GL. A brief history of endoscopy, laparoscopy, and laparoscopic surgery. J Laparoendosc Adv Surg Tech A 1997; 7: 369-73.
13. Soper NJ, Barteau JA, Clayman RV, Ashley SW, Dunnegan DL. Comparison of early postoperative results for laparoscopic versus standard open cholecystectomy. Surg Gynecol Obstet 1992; 174: 114-8.
14. Sinha R, Gurwara AK, Gupta SC. Laparoscopic surgery using spinal anesthesia. JSLS 2008; 12: 133-8.
15. Reynolds F. Damage to the conus medullaris following spinal anesthesia. Anaesthesia 2001; 56: 238-47.
16. Standring S. Gray's Anatomy. 39th ed. Edinburgh, Elsevier. 2005, pp 1084-6.
17. Freund FG, Bonica JJ, Ward RJ, Akamatsu TJ, Kennedy WF Jr. Ventilatory reserve and level of motor block during high spinal and epidural anesthesia. Anesthesiolosy 1967; 28: 834-7.