

Low-dose combined spinal-epidural anesthesia for a patient with a giant hiatal hernia who underwent urological surgery

Mi Kyeong Kim, Junoik Shin, Jeong-Hyun Choi
and Hee Yong Kang 

Abstract

A hiatal hernia refers to herniation of the abdominal organs through the esophageal hiatus of the diaphragm. A giant hiatal hernia affects digestive and cardiopulmonary function by compressing the organs. We report a patient who had low-dose combined spinal and epidural anesthesia (CSEA) for safe and effective anesthesia for conservative treatment of a giant hiatal hernia. An 84-year-old woman who had a giant hiatal hernia was scheduled for ureteroscopic removal of a ureteral stone. CSEA was performed at the L4 to L5 lumbar interspace and an epidural catheter tip was placed 5 cm cephalad from the inserted level. The T12 block was checked after 10 minutes of intrathecal injection of 6 mg of 0.5% bupivacaine. The T10 block was checked after additional injection of 80 mg of 2% lidocaine through the epidural catheter. During anesthesia and surgery, the patient's vital signs remained stable and the operation was completed within 1 hour without any problems. In conclusion, low-dose CSEA may be safely used without any cardiopulmonary and gastrointestinal problems in patients with a giant hiatal hernia undergoing urological surgery.

Keywords

Epidural anesthesia, hiatal hernia, spinal anesthesia, older patient, ureteral stone, urological surgery

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Department of Anesthesiology and Pain Medicine, Kyung Hee University, Seoul, South Korea

Corresponding author:

Hee Yong Kang, Department of Anesthesiology and Pain Medicine, Kyung Hee University Hospital, 23, Kyungheedaero, Dongdaemun-gu, Seoul 02447, South Korea.

Email: hykang531@gmail.com



Introduction

A hiatal hernia refers to herniation of the abdominal organs through the esophageal hiatus of the diaphragm. The prevalence of hiatal hernia increases with age, and is estimated to occur in approximately 10% to 15% of the general population.¹ Hiatal hernia affects the digestive and cardiopulmonary system because the abdominal organs are herniated into the thoracic cavity. Therefore, symptoms, such as nausea, vomiting, dyspnea, and chest pain, may also occur.² Aspiration by reflux of gastric contents should be considered in anesthesia of patients with hiatal hernia.³ Although rapid tracheal intubation is performed to prevent aspiration, there is still a risk of aspiration, hypoxia, and an adverse effect on cardiovascular function. Spinal anesthesia causes hypotension because of a rapid increase in the block level, which can lead to nausea and vomiting,⁴ and epidural anesthesia is delayed and shows inadequate motor block.⁵ Therefore, an alternative anesthetic method for surgery is required in this situation.

Low-dose combined spinal and epidural anesthesia (CSEA) is used in hemodynamically unstable patients. This is used because of the stepwise increase to the desired block level by injecting a local anesthetic via an epidural catheter after spinal anesthesia with a small amount of local anesthetic.^{6,7} This method was applied to a patient who had to be stable hemodynamically during surgery and needed to avoid a high level of spinal anesthesia because of a giant hiatal hernia. We report a case of successful use of combined spinal-epidural anesthesia for urological surgery in an older patient with a giant hiatal hernia.

Case report

Written informed consent for the patient's information and images to be published was

provided by the patient. An 84-year-old woman was scheduled for ureteroscopic removal of a ureteral stone. The patient's height and weight were 140 cm and 48 kg, respectively. A preoperative chest X-ray showed that the patient had a hiatal hernia type IV (Figure 1), which was not present in her previous chest X-ray taken 10 years previously. Computed tomography scans also showed the stomach and duodenum in the posterior mediastinum (Figure 2A, B). Subsegmental atelectasis was present at the base of both lungs on chest X-ray, but pulmonary function test results were normal. Arterial blood gas analysis was not performed. Electrocardiography showed T wave inversion in leads V3 to V5, and a transthoracic echocardiogram showed grade 1 diastolic dysfunction with an ejection fraction of 67%. The patient had occasional dyspepsia, but did not complain of cardiopulmonary symptoms. Before the surgery, consultation about the correction of hiatal hernia was performed. Conservative treatment was recommended because the patient's symptoms were not severe and she was an older patient.

On the day of surgery, she had a sufficient nil per os time for 10 hours to prevent

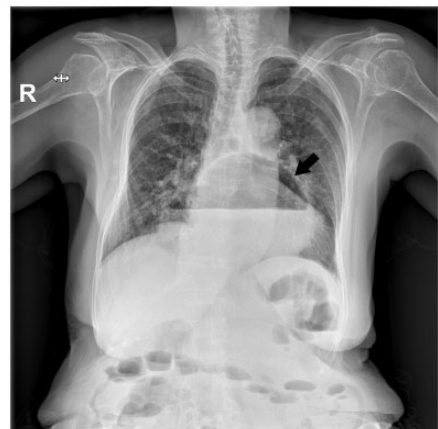


Figure 1. Preoperative chest X-ray shows a giant hiatal hernia (black arrow)

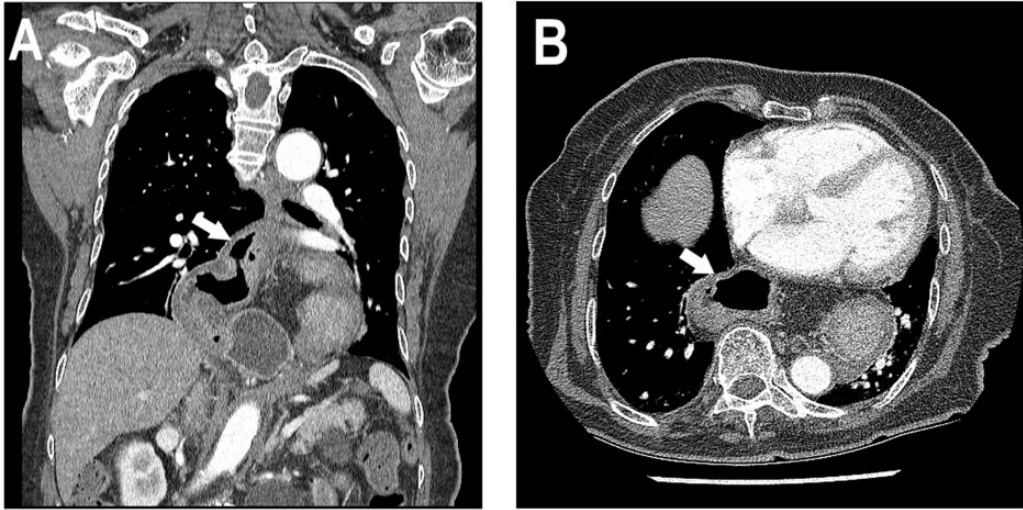


Figure 2. Computed tomography scans of coronal (A) and transverse sections (B) show a large hernia sac (white arrow) in the posterior mediastinum

aspiration during anesthesia, and no pre-medication was performed. On arrival in the operating room, her blood pressure, pulse rate, and oxygen saturation were 140/60 mmHg, 65 beats/minute, and 96%, respectively. An electrocardiogram showed sinus rhythm. Low-dose CSEA was performed at the L4 to L5 lumbar interspace using the needle-through-needle technique (spinal epidural set; Portex, Keene, NH, USA). An 18-gauge Tuohy needle was introduced into the epidural space using the loss-of-resistance technique. A 27-gauge spinal needle was then placed through the Tuohy needle, and intrathecal injection of 6 mg of 0.5% bupivacaine was performed after confirming free flow of cerebrospinal fluid. The spinal needle was removed and a 20-gauge epidural catheter was inserted 5 cm cephalad within the epidural space. Neither blood nor cerebrospinal fluid was aspirated via the epidural catheter. The patient was placed in the supine position and the T12 block was checked after 10 minutes. A total of 80 mg of 2% lidocaine was then injected through the epidural catheter and the T10

block was checked after 20 minutes. To prevent hypotension, which is one of the risk factors for nausea and vomiting, 300 mL of normal saline was administered during anesthesia. Blood pressure, pulse rate, and oxygen saturation were 128/58 mmHg, 63 beats/minute, and 98%, respectively. During the surgery, the patient was in the lithotomy posture, but did not complain of nausea, vomiting, dyspnea, or chest discomfort. Oxygen saturation was maintained at 98% to 99% while 2 L of oxygen was supplied via a nasal prong, and blood pressure remained within the normal range. The operation was completed within 1 hour without any problems.

Discussion

Hiatal hernia is classified into four types. Type IV is characterized by the presence of the stomach and intra-abdominal organs, such as the omentum, colon, or small bowel within the hernia sac. Hiatal hernia type IV is the least common and has a prevalence rate of 0.1% of total hiatal hernias. Furthermore, a giant hiatal

hernia, such as in our case, is rare.⁸ The symptoms of a giant hiatal hernia range from minimal to situations requiring surgery, such as volvulus, incarceration, perforation, or recurrent pneumonia. Therefore, treatment for this condition varies from conservative management to emergency surgery, depending on the patient's condition.

Hiatal hernia can affect reflux of gastric contents through mechanisms, such as hypotensive low esophageal sphincter (LES) and transient LES relaxation,⁹ and the risk of aspiration pneumonia in older patients is increased.¹⁰ LES pressure further decreases during induction of anesthesia.¹¹ Therefore, rapid sequence intubation should be applied in patients with hiatal hernia when regional anesthesia is not possible, but this could lead to an accelerated heart rate and there is still the possibility of aspiration.¹²

The incidence of pulmonary complications has been significantly reduced in spinal anesthesia compared with general anesthesia.¹³ However, in older patients, the analgesic level obtained after spinal anesthesia is approximately three to four levels higher than that in young adult patients. Therefore, hypotension, tachycardia, and dyspnea frequently occur in older patients.¹⁴ To obtain anesthesia of the same level, a small amount of local anesthetic is used in spinal anesthesia in older patients compared with young adults.¹⁵ In low-dose CSEA, anesthesia can be achieved by injecting a relatively small amount of a local anesthetic followed by an epidural injection. This helps to increase the subarachnoid block to the desired level with hemodynamic stability and significantly less hypotension and less vasopressor requirements.¹⁶ For this reason, low-dose CSEA can be safely and effectively performed in older patients with severe aortic stenosis that is considered as a contraindication of neuraxial anesthesia.⁶ In our case,

an additional epidural injection of a local anesthetic resulted in the desired level of anesthesia and the patient's vital signs remained stable.

After spinal anesthesia, nausea and vomiting occur at a rate of approximately 20%, and risk factors include spinal anesthesia above the T5 level, hypotension, and opioid administration.¹⁷ Increased vagal activity after sympathetic block causes nausea by increasing peristalsis in the gastrointestinal tract. Although atropine is frequently used for treating nausea after high spinal anesthesia, heart rate is also accelerated, which can cause cardiac dysfunction if cardiac function is limited because of hiatal hernia.¹⁸ Therefore, high spinal anesthesia should be avoided and an adequate block level should be slowly increased through low-dose CSEA. This method is mainly used to minimize hemodynamic changes and prevent aspiration in cesarean section,⁷ and could be effectively applied to our patient with a giant hiatal hernia.

Preoperative premedication can prevent nausea and vomiting. The following antiemetics can be used as premedication: antihistamines, phenothiazines, corticosteroids, benzamides, anticholinergic, neurokinin-1 antagonists, 5-HT₃ receptor antagonists, and cannabinoids.¹⁹ In our case, we did not administer premedication. A sufficient nil per os time was maintained instead, and a bolus of normal saline was administered to prevent nausea and vomiting due to hypotension during anesthesia.²⁰

With CSEA, benefits from spinal and epidural anesthesia can be obtained while avoiding the side effects of spinal anesthesia (acute reduction in blood pressure, inadequate postoperative pain relief) and epidural anesthesia (delay in onset and inadequate motor block).⁵ There are risks, such as regurgitation and a negative effect on cardiopulmonary function, when a patient with a giant hiatal hernia receives general anesthesia. These risks can be

avoided by using regional anesthesia, but spinal anesthesia can induce side effects, such as nausea, vomiting by high spinal anesthesia, hypotension, or increased vagal tone.³ These complications by spinal anesthesia can be prevented by low-dose CSEA.

In conclusion, low-dose CSEA may be safely used without any cardiopulmonary and gastrointestinal problems in patients with a giant hiatal hernia who undergo urological surgery.

Declaration of conflicting interest

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ORCID iD

Hee Yong Kang  <http://orcid.org/0000-0001-7506-1375>

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