Asystole Developed during Total Gastrectomy under General Anesthesia Combined with Thoracic Epidural Anesthesia

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Abstract

We report a 73-year-old woman who developed sudden bradycardia and asystole due to vagal reflex during transabdominal total gastrectomy under general anesthesia with thoracic epidural analgesia. General anesthesia was induced with propofol, fentanyl and maintained with sevoflurane and epidural infusion of lidocaine. Severe bradycardia, followed by asystole was detected on electrocardiography 10 minutes after starting surgery, triggered by the retraction of the abdominal wall and intestines. Blood pressure and heart rate recovered in response to atropine, ephedrine and chest compressions in 10 seconds. Surgery was completed uneventfully and the patient was discharged without complications. For preventing life-threatening bradycardia and asystole by vagal reflex, we suggest the use of atropine prior to the operations in patients undergoing abdominal or ophthalmic surgery, where vagal reflex may occur.

Key Words: Asystole; General anesthesia; Thoracic epidural anesthesia; Mesenteric vagal reflex; Complication

Introduction

Life-threatening complications such as bradycardia, hypotension and asystole may develop during abdominal surgery1). Herein, we report a case of sudden, severe bradycardia followed by asystole during transabdominal total gastrectomy.

Case Report

A 73-year-old female (height 155 cm, weight 47 kg) with American Society of Anesthesiologists physical status I was scheduled for transabdominal total gastrectomy for gastric cancer. She had no significant past or family histories. She received no premedication; blood pressure was 166/84 mm Hg and heart rate was 75 beats/minute upon entering the operating room. An epidural catheter was inserted 6 cm cephalad at the T8-9 interspace and had no return of blood or cerebrospinal fluid. A 2 mL test dose of lidocaine 1% with epinephrine 1:200000 was negative for spinal or intravascular effects after 5 minutes. General anesthesia...
was induced with fentanyl 100 μg, propofol 80 mg, vecuronium 5 mg, and maintained with air, oxygen and 1-1.5% sevoflurane. After confirming no return, a 6 mL bolus of plain lidocaine 1.5% was injected through the epidural catheter, followed by continuous infusion at 4 mL/hour. Blood pressure was 124/70 mm Hg and heart rate was 50-60 beats/minute at this time.

Severe bradycardia (10-20 beats/minute, sinus rhythm) suddenly developed, followed by asystole on electrocardiography, 10 minutes after starting surgery when the abdominal wall and intestines were retracted to examine the peritoneal dissemination of cancer. Infusion of epidural lidocaine was stopped, atropine 0.5 mg and ephedrine 5 mg were administered. Surgery was discontinued, chest compressions were immediately started, and the heartbeat resumed approximately 10 seconds after onset of asystole. Heart rate increased to 80 beats/minute and blood pressure returned to 95/56 mm Hg with no further treatments. Subsequently, a 12-lead ECG showed sinus rhythm with QT interval of 0.41 seconds and no abnormal findings. Transesophageal echocardiography revealed normal wall motion of the heart ventricles. After confirming hemodynamic stability and normal arterial blood gas data (pH 7.424, PCO₂ 33 mm Hg, PO₂ 439 mm Hg, HCO₃⁻ 21.3 mEq/L, and BE -2.4 mEq/L at FiO₂=1.0), surgery was resumed.

Since there were no marked changes in hemodynamic status thereafter, epidural infusion of lidocaine 1.5% at 4 mL/hour was resumed after reconfirming no return of blood or cerebrospinal fluid. An abrupt but transient decrease of heart rate to 40 beats/minute was detected during intraabdominal lavage before closing the peritoneum. Heart rate recovered spontaneously and blood pressure remained stable. The anesthesia time was 4 hours 57 minutes and operation time was 4 hours 20 minutes, while intraoperative blood loss was 500 mL and intraoperative fluid infusion was 2700 mL. After surgery, consciousness fully recovered and the patient was returned to the ward, and discharged uneventfully.

**Discussion**

In the patient described here, the cause of cardiac arrest would be vagal reflex since severe bradycardia and asystole were induced by retracting the abdominal wall and intestines. Prompt
recovery of heart rate by ceasing surgery, starting chest compressions and infusion of atropine and ephedrine also support this diagnosis\textsuperscript{2}, together with the similar episode observed during intraabdominal lavage. Stimulation to the celiac plexus surrounding the celiac trunk by retracting the stomach or gall bladder leads to increased mesenteric vagal nerve activity\textsuperscript{1}, resulting in the development of bradycardia\textsuperscript{3}.

Manipulations of the intestinal organs during laparotomy can trigger vasovagal reflex, manifested by sudden hypotension, tachycardia, facial and extremity flushing, and cutaneous hyperemia\textsuperscript{4}. In our patient, bradycardia and hypotension, but no facial flushing were observed, suggesting that the condition was most likely vagal reflex without vascular dilatation\textsuperscript{2}.

Epidural anesthesia might induce severe bradycardia and hypotension by decreasing the cardiac preload\textsuperscript{5}. Intravascular volume depletion would further deteriorate this condition. In our patient, since epidural catheter was inserted at high thoracic vertebral levels, sympathetic nerve efferent fibers would have been extensively blocked, leading to a relative predominance of parasympathetic nerve activity.

Although bradycardia and asystole are able to be induced by sevoflurane, it would not have been the direct cause of asystole in our patient, since those symptoms are usually induced by high concentration of sevoflurane, particularly during induction\textsuperscript{6}. Opioids such as remifentanil and sufentanil may induce asystole when concomitantly used with sevoflurane\textsuperscript{7,8}. Abrupt onset of hypotension and bradycardia is also accompanied with anaphylaxis, of which neuromuscular blocking agents are the most common cause during anesthesia\textsuperscript{9}. In our patient, however, blood pressure and heart rate were stable during and after administration of rocuronium before tracheal intubation or during surgery, and their duration was very short, suggesting that it was unlikely anaphylaxis.

A point of issue is whether surgery should be continued after recovery from asystole. Based on the diagnosis of vagal reflex and prompt recovery of blood pressure, heart rate, normal blood gas data and echocardiographic findings, we decided to resume the surgery. Another point of issue is the prevention and treatment of sudden onset of life-threatening bradycardia. Atropine may prevent the development of bradycardia by vagal reflex triggered by visceral traction, ocular ball compression by parasympathetic blockading effect\textsuperscript{1}. Although atropine may induce adverse reactions such as tachycardia, dry mouth, increase of intraocular pressure\textsuperscript{10}, its prophylactic effect for preventing the vagal reflex-induced bradycardia has been confirmed\textsuperscript{11}.

We suggest the use of atropine prior to the operation in patients undergoing abdominal or ocular surgery to whom it is able to be administered safely, such as adult patients or children with indwelling intravenous lines. It should be avoided in patients with glaucoma or arrhythmia\textsuperscript{10}. Also, it should be carefully administered intramuscularly to prevent nerve injury. In case parasympathetic reflexes occurred in patients with glaucoma, temporarily discontinuing surgery and waiting for the recovery of pulse rate, rather than using atropine. Ephedrine might able to be used as an alternative to atropine when atropine cannot be given.

**Conclusion**

Bradycardia and asystole due to vagal reflex may occur during laparotomy under combined epidural and general anesthesia. If bradycardia develops, immediate discontinuation of surgery, infusion of atropine or ephedrine is strongly recommended.
References


