CASE REPORTS

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Spontaneous Ventilation and Epidural Anesthesia in a Patient with a Large Tracheoesophageal Fistula and Esophageal Cancer Undergoing Colon Interposition

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SURGICAL treatment of esophageal carcinoma includes radical resection or palliative bypass.[1] Palliative bypass procedures are indicated in patients with a tracheoesophageal fistula (TEF) to restore swallowing ability[2] and to prevent recurrent pulmonary aspiration. High-frequency jet ventilation (HFJV) has been cited as the only satisfactory technique for use in patients with TEF who require GA and muscle relaxation, because controlled ventilation during the surgical procedure is associated with several problems.[3,4] The purpose of this report is to describe the use of epidural anesthesia and spontaneous ventilation in a patient undergoing an esophageal palliative bypass operation for the management of TEF.

Case Report

A 51-yr-old man presented with a diagnosis of esophageal squamous cell carcinoma. The man had an 80-pack-yr history of cigarette smoking with COPD and coronary artery disease (anteroseptal myocardial infarction in 1980). The patient initially presented with a small TEF (2–3 mm) and, because of his poor clinical condition, he was treated with chemotherapy, together with intensive enteral nutritional support (through a jejunal catheter).

Eight months later, after two cycles of cisplatin-bleomycin and methotrexate treatment, the patient was readmitted because of respiratory difficulties. The TEF had increased in size to 2 cm long and 1 cm wide. The worsened condition, associated with pulmonary aspiration and inability to place an esophageal prosthesis, prompted a palliative esophageal bypass procedure with colonic interposition. Preoperative assessment showed an ASA physical status 3–4 patient weighing 48 kg; laboratory findings are shown in table 1. He had a productive cough with copious amounts of foul sputum and paroxysms of coughing while swallowing or drinking. A chest x-ray showed an enlarged mediastinum with patchy bilateral infiltrates in the lower lung fields. Other laboratory data were within normal limits. The patient was premedicated with atropine sulfate (0.5 mg intramuscularly) 1 hr before the operation. Under local anesthesia, central venous (subclavian) and radial artery catheters were inserted. A Blackemore-Sengstaken esophageal tube (Willy Rüsch, Waiblingen, Germany) was positioned into the stomach. The lower balloon was inflated and secured to obstruct the cardia of the stomach, blocking any possible gastric acid reflux into the TEF. The esophageal balloon was then inflated to reduce the risk of aspiration of saliva through the TEF. The patient immediately stopped coughing. An epidural catheter (Arrow 19 G; Reading, PA) was inserted into the epidural space through a Tuohy needle (17 G) at T7–T8 level. After a test dose of 2 ml of 1% lidocaine, a mixture containing 100 mg bupivacaine, 200 mg mepivacaine, and fentanyl 150 μg, was slowly injected into the epidural space, 3–4 ml every 5–6 min, until sensory block was achieved at a level of T2–L3 (total volume of 24 ml in 40 min), after which the local anesthetic and fentanyl mixture was infused at 8 ml/h with a syringe pump. The dermatomal sensory block level was evaluated with both pinprick and alcohol swab. Nasopharyngeal O_2 supplementation with 2 l/min and an initial dose of 100 μg fentanyl was given intravenously before starting surgery. Electrocardiogram, invasive arterial pressure, CVP, SpO_2, urinary output, and body temperature were continuously monitored. Samples for arterial blood gas (ABG) measurements were taken every 30 min (table 2).

The observed respiratory and hemodynamic parameters remained stable during the surgical procedure.

During surgery, which lasted for 300 min, the patient was awake, relaxed, and talking with the anesthesiologist. Fentanyl (100 μg) was administered intravenously during colon mobilization while traction was applied. Surgery consisted of a laparatomy and cervicotomy. The transverse and descending colon with their vascular arcade were mobilized. The distal end of the colon segment was passed through a subcutaneous tunnel to the left side of the neck, never entering the thoracic cavity. In the neck and upper thoracic areas, the regional anesthesia was judged insufficient (C5–C4–C3), and 15 ml 1% lidocaine was infiltrated. The cervical esophagus was divided and joined to the colon conduit on the left side of the neck, producing a lateral cervical stoma. The distal portion of the esophagus was then sutured, and the residual esophageal lumen was externally drained with a Petzer tube.

The entire procedure lasted 380 min, including anesthetic preparation. Blood loss was estimated at 1,000 ml; fluid replacement

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Table 1. Preoperative Laboratory Findings

Hemoglobin	10 g/dl
Serum albumin	2.4 g/dl
VC	3.1 l
FEV_1	1.2 l
FEV_1/VC	39%
Arterial blood gases	
*p*H	7.43
Pa_{CO_2}	47 mmHg
Pa_{O_2}	73 mmHg
FI_{O_2}	0.21

VC = vital capacity; FEV_1 = forced expiratory volume after 1 s; Pa_{CO_2} = arterial carbon dioxide tension; Pa_{O_2} = arterial oxygen tension; FI_{O_2} = inspired oxygen fraction.

consisted of 1 unit of packed red cells, 2 l Hemagel, 2.5 l Ringer's lactate, and 1 l 5% dextrose. Diuresis was 200 ml/h, with a total volume of 1,200 ml at the end of the procedure. Thirty minutes before the end of the surgical procedure, 2 mg of morphine sulphate in a saline solution of 10 ml was infused epidurally. The morphine infusion was repeated as necessary in the postoperative period. The epidural catheter was removed on the third postoperative day. The cervical stoma was closed after 35 days under local anesthesia. After 45 days, the patient was discharged from the hospital with all the anastomoses healed, in good condition, able to eat and drink, with a gain of 3 kg since the initial admission. The patient died 5 months later because of massive hemorrhage into the lungs from the necrotic tumor.

Discussion

In this patient, a curative resection of the tumor was judged impossible because of the tracheal infiltration, and palliative surgery was performed. The aim of the treatment was to prevent esophageal or gastric contents from entering the respiratory tract, and to restore swallowing and alimentary continuity. High-frequency positive-pressure ventilation or HFJV have been advocated for management of patients with a tracheal defect very close to the carina.[3–6] A disadvantage is that HFJV may force blood and debris into the lower airways,[6] although a previous report did not observe macroscopic inhalation of blood during surgery.[3] In our patient, the large TEF was associated with a stenosis of the airway because of tumor. This situation created a problem in using HFJV for the following reasons: trauma from the tube (or a double lumen tube) passing over the friable lesion would have produced hemorrhage; the use of HFJV with the endotracheal tube tip above the tumor and TEF increase the risk of pulmonary soiling, and HFJV would produce an air leak through the large TEF. A small endobronchial tube would have been insufficient to guarantee acceptable ventilation, because of the poor pulmonary function and the long procedure (380 min). The use of a small (6 mm) endobronchial tube with direct fiberoptic bronchoscopic positioning was considered,[6] and it was prepared in case of an emergency procedure for IPPV, as described by Grebenik.[4] Normally, the goal of anesthetic management in a patient with a TEF is, first, to isolate the fistula using endobronchial intubation to prevent aspiration, and, second, to let the patient ventilate safely without applying any positive pressure to the fistula.

In a patient who requires palliative surgery, it is important that spontaneous respiration, without the need for an IPPV, be maintained after the procedure. In this patient, we demonstrated that spontaneous respiration maintained adequate ventilation, both intra- and postoperatively. Continuous infusion of local anesthetics through the epidural catheter produced the desired level of analgesia, without any deleterious hemodynamic results. Furthermore, the use of Blackemore-Sengstaken technique, to prevent soiling the lungs through the TEF, was effective and well tolerated in the first 120 min (until the esophagus was completely isolated and externally drained).

Table 2. Arterial Blood Gases and Respiratory Rate during and after Surgery with Oxygen Supplementation

		Time Elapsed (min)											
	Preoperative	30	60	90	120	150	180	210	240	270	300*	360	380
*p*H	7.41	7.39	7.42	7.42	7.42	7.38	7.36	7.37	7.38	7.37	7.40	7.42	7.46
Pa_{O_2} (mmHg)	70	82	88	81	93	110	124	115	105	100	63	59	65
Pa_{CO_2} (mmHg)	47	45	46	48	46	47	49	48	49	47	44	48	46
Respiratory rate (breaths/min)	18	16	16	17	16	15	14	15	15	16	16	14	16

Pa_{O_2} = arterial oxygen tension; Pa_{CO_2} = arterial carbon dioxide tension.

* End of surgery and oxygen supplementation.

In summary, epidural anesthesia provided sufficient anesthesia for a patient with esophageal cancer and a TEF who underwent colon interposition and cervical esophagostomy.

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Vicodin-induced Fulminant Hepatic Failure

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ANESTHESIOLOGISTS in greater numbers are participating in the management of postoperative pain. On cessation of patient-controlled analgesia, or discontinuation of epidural opioids, anesthesiologists on pain-management teams are often called upon to prescribe oral analgesics. Vicodin, a combination of 5 mg hydrocodone and 500 mg acetaminophen, is often prescribed in this setting. We report on the cases of three patients in whom the use of Vicodin resulted in fulminant hepatic failure because of acetaminophen hepatotoxicity.

Case 1

This patient was a 19-yr-old woman with a long history of ulcerative colitis. She underwent an uncomplicated ileostomy closure, but was readmitted to an outside hospital 9 days later with small bowel obstruction. She required exploratory laparotomy and lysis of adhesions. On postoperative day 2, after she was able to take clear liquids, her parenteral opioids were discontinued, and she was prescribed Vicodin 1 or 2 tablets every 4 h as needed for pain. Over the next 4 days, she received approximately 40 Vicodin tablets, as prescribed.

On postoperative day 6, she became obtunded. A physical examination revealed tachypnea and hypotension. Laboratory studies revealed hypoglycemia (blood glucose, 23 mg/dl) and severe metabolic acidosis: arterial blood gas, with $F_{I_{O_2}}$ 1.0, was *p*H 7.12; P_{CO_2} was 18 mmHg; P_{O_2} was 522 mmHg; and base deficit was −21. Liver function tests revealed total bilirubin of 2.6 mg/dl, aspartate aminotransferase (SGOT) of 5,940 U/l, alanine aminotransferase (SGPT) of 1,730 U/l, prothrombin time (PT) of > 100 s, and partial thromboplastin time (PTT) of > 120 s. Her acetaminophen level was 47 μg/ml (therapeutic levels 0.25–0.64 mg/dL), and she was treated with N-acetylcysteine. Progressive deterioration in mental status necessitated tracheal intubation and ventilatory support. Dopamine was administered for profound hypotension.

She was transferred to University of California, San Francisco Moffitt-Long Hospitals with a diagnosis of fulminant hepatic failure. Her course was complicated by recurrent gastrointestinal bleeding, consumptive coagulopathy, acute renal failure, candida sepsis, adult respiratory distress syndrome, and cerebral edema. Because of her multiorgan failure, she was not considered a suitable candidate for liver transplantation, and she died on the 55th posttransfer day.

Case 2

This patient was a 29-yr-old woman with a history of seizures, chronic low back pain, and depression. Her medication regimen included phenytoin, phenobarbital, lorazepam, amitryptilene, Soma (carisoprodol and aspirin), furosemide, verapamil, nonsteroidal antiinflammatory agents, codeine, acetaminophen, and Vicodin. On the

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