

Death on Induction of Anesthesia for Cervical Node Biopsy

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Cardiac arrest and death on induction of anesthesia is a rare and frightening event. The following case emphasizes the anesthetic hazards of administering anesthesia to patients with mediastinal masses.

REPORT OF A CASE

A 9-year-old, 20-kg boy had been well until six weeks prior to admission when he developed a flu-like illness with a cough and intermittent fever which was treated at home with rest and antibiotics. He failed to improve and ten days prior to admission became increasingly short of breath with decreased exercise tolerance. Four days prior to admission he became cyanotic and lost consciousness while straining with a bowel movement. A chest roentgenogram revealed an anterior mediastinal mass with a tentative diagnosis of mediastinal lymphoma. To obtain a tissue diagnosis prior to initiating therapy, a biopsy of a cervical node was scheduled.

Preoperative examination revealed a thin boy with tachypnea (24 breaths/min), and mild suprasternal and intercostal retractions. Dyspnea increased markedly when supine and he slept in the lateral position. Palpable anterior and posterior cervical lymph nodes were present. Chest examination revealed bilateral air entry with coarse ronchi and a prolonged expiratory phase over the left hemithorax, but no evidence of tracheal deviation. Anteroposterior and lateral chest roentgenograms showed a widened mediastinum without definitive evidence of airway obstruction. Arterial blood pressure was 110/70 torr, heart rate 90/min, and temperature 37° C. Normal heart sounds without a murmur and a normal rhythm were heard. An electrocardiogram was not done because there was no clinical evidence of myocardial dysfunction. Normal peripheral pulses were palpable, and jugular venous distention was not evident.

Atropine, 0.4 mg, was given im 45 min prior to the induction of anesthesia. The back of the operating room table was elevated so the patient was in the sitting position. Systolic arterial blood pressure was 100 torr and heart rate 95/min. Anesthesia was induced by inhalation of oxygen and increasing concentrations of halothane. Because possible airway obstruction was anticipated, we wanted to maintain spontaneous ventilation. The induction was prolonged and cyanosis was noted despite apparently satisfactory ventilation. Halothane was discontinued without improvement and the patient was placed supine for endotracheal intubation. Heart rate slowed to 60/min when the trachea was intubated. Atropine, 0.4 mg, iv, was then given without effect, and the heart rate continued to decrease. External cardiac massage was initiated

with administration of intravenous epinephrine, sodium bicarbonate, and calcium chloride in appropriate resuscitative doses. The EKG initially showed bradycardia which progressed to asystole. Although ventilation of the lungs continued without difficulty, air entry was reduced over the left lung, and the left hemithorax was aspirated. No air was obtained. Additional resuscitative measures included 600 mg methylprednisolone, iv, and blood volume expansion with 5 per cent albumin and lactated Ringer's solution. Despite continued resuscitative efforts and repeated drug administration, cardiac asystole persisted with only rare electrical activity. Pericardial aspiration was attempted, but little aspirate was obtained. After 30 min, thoracotomy was performed and open cardiac massage was undertaken but cardiac activity was never reestablished and resuscitative efforts were stopped after 60 min.

At autopsy, a massive malignant lymphoma, firmly adherent to the sternum and involving the entire anterior mediastinum was found. The tumor enveloped the heart with infiltration of the pericardium, the pulmonary artery and both hilar areas, compressing the left main bronchus, but not the trachea or the right main bronchus.

DISCUSSION

Dyspnea and intolerance of the supine position was attributed to airway compression by the mediastinal mass. Tumor compression of the left main bronchus was insufficient to account for the symptoms and dyspnea occurred because of inadequate cardiac output. The encasement of the heart by tumor mass had a hemodynamic effect similar to pericardial tamponade. The fixed, low cardiac output was aggravated by the supine position (further compression by tumor), straining at stool (Valsalva maneuver), and the myocardial depressant effects of halothane. Resuscitative efforts included placement in the supine position and the initiation of positive pressure ventilation, both of which aggravated the decreased cardiac filling and further reduced cardiac output. In addition, tumor infiltration of the pulmonary artery impaired right ventricular output.

There are no reports on anesthetic management of patients with mediastinal tumors that refer to cardiac dysfunction and tamponade secondary to the tumor mass. Several authors¹⁻⁷ have described the problems which occur secondary to compression of the trachea or bronchi. Some of these authors^{2,4,5} emphasize the importance of maintaining spontaneous ventilation during induction of anesthesia. Piro *et al.*⁶ recommend radiation to mediastinal tumors in patients with Hodgkins disease prior to endotracheal anesthesia to prevent life-threatening airway complications. Our patient demonstrates that cardiac dysfunction secondary to the tumor mass can be even more significant and life-threatening.

We conclude that preoperative assessment of patients

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with mediastinal masses who are symptomatic (dyspnea, intolerance of supine position) should include studies to assess cardiac status, that is, an EKG, examination for pulsus paradoxus and echocardiography. If there is evidence of cardiac impairment in a patient who must undergo diagnostic cervical node biopsy, we recommend local anesthesia in the sitting position.⁸ If tumor resection is necessary, we advocate preoperative radiation or chemotherapy in an attempt to shrink the tumor mass prior to administering general anesthesia.

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Anesthesia for Patients with Insulinoma Treatment with Oral Diazoxide

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Insulinoma, first described in 1924 by Harris,¹ is a beta islet cell tumor of the pancreas that produces marked hypoglycemia resulting from sudden, episodic, and massive release of endogenous insulin. Avoidance of hypoglycemia is the cornerstone of medical management in patients with this disorder prior to surgical excision of the tumor. Fraser² first described hyperinsulinism during anesthesia and the intraoperative and postoperative episodes of hypoglycemia responding to rapid administration of glucose intravenously. The importance of rapid, frequent intraoperative blood glucose determinations has been emphasized by many authors,²⁻⁴ and the prophylactic use of 50 per cent glucose to maintain moderate intraoperative hyperglycemia has been suggested.⁴

Anesthetic techniques previously reported for surgical removal of insulinoma include nitrous oxide-relaxant techniques^{3, 4} and methoxyflurane.⁵ Colella and Vandam⁶ recommended diethyl ether as the anesthetic of choice since it has the theoretical advantage of releasing catecholamines which enhance hepatic glycogenolysis and inhibit insulin release. Use of enflurane for maintenance of general anesthesia for insulinoma surgery has not previously been published.

Diazoxide (Proglycem®), a nondiuretic benzothiadiazine derivative with peripheral vascular dilating activity, directly inhibits release of pancreatic insulin and has proven to be a major advance in the medical management of patients with insulinoma.⁷ No discussion of anesthetic implications for patients taking oral diazoxide preoperatively exists.

We describe two cases where enflurane was utilized to anesthetize patients for surgical removal of insulinomas, where oral diazoxide was used preoperatively to combat perioperative hypoglycemia. In addition, limiting the intraoperative infusion of 5 per cent dextrose containing solutions to 2 ml · kg⁻¹ · h is suggested, and a possible drug interaction between diazoxide and thiopental is proposed.

REPORT OF TWO CASES

Patient 1. A 51-year-old, 80-kg female was evaluated for hypoglycemia. A tentative diagnosis of insulinoma was entertained when her

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