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Fiberoptic Endobronchial Intubation for Resection of an Anterior Mediastinal Mass

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Growth of a cervical goiter through the thoracic inlet into the retrosternal space is a rare cause of an anterior mediastinal mass.¹ This uncommon lesion frequently presents with life-threatening respiratory obstruction.²⁻⁴ It is not sensitive to radiation therapy and carries a mortality rate approaching 3% if not surgically corrected.^{5,6} In common with other types of anterior mediastinal masses, loss of respiratory muscle tone may precipitate complete obstruction of the tracheobronchial tree, which may not be relieved by passage of an endotracheal tube through the vocal cords.^{7,8} If this occurs, an intraoperative death may rapidly follow.⁹ The case of a patient in whom fiberoptic endobronchial intubation during spontaneous respiration allowed safe induction of anesthesia for excision of a massive intrathoracic goiter is presented.

CASE REPORT

A 60-yr-old, 178-cm, 120-kg woman was scheduled for urgent mediastinoscopy and median sternotomy for resection of an anterior mediastinal mass. Two months prior to admission she had noticed a progressive hoarseness of her voice, a continual sense of fullness in her upper chest, and a complete inability to sleep on her back. Three weeks prior to admission she developed audible wheezing and shortness of breath, which was so severe that she could not walk more than a few short steps. The patient had a long history of exogenous obesity.

Admission vital signs were as follows: blood pressure 130/80 mmHg, heart rate 80 beats/min, respiratory rate 26 breaths/min, and axillary temperature 37° C. Admission hemogram, serum electrolytes, liver function tests, coagulation profile, urinalysis, and ECG were completely within normal limits. Analysis of arterial blood gases (F_{IO₂} 0.2) revealed the following: PaO₂ 46 mmHg, PaCO₂ 71.4 mmHg, pH_a 7.27, % hemoglobin saturation 73. Analysis of arterial blood following administration of 2 l/min O₂ by nasal cannulae showed: PaO₂ 73 mmHg, PaCO₂ 66 mmHg, pH_a 7.39, % hemoglobin saturation 95.

A chest radiograph obtained at admission showed a left upper mediastinal mass with displacement of the cervical and thoracic trachea to the right; a small mass in the right hilum was also noted. An Iridium-131 thyroid scan revealed a cold nodule in the left lobe of the thyroid with an area of nonhomogeneous uptake extending into the mediastinum. Computerized tomography of the thorax revealed continuity of the cervical, mediastinal, and hilar masses with posterior displacement of the trachea and extrinsic compression of the carina. An aortogram demonstrated compression of the aorta and brachiocephalic vessels. Severe dyspnea prevented measurement of flow-volume loops in the upright or supine positions.

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One hour before surgery 10 mg metoclopramide and 300 mg cimetidine were administered im and 30 ml sodium citrate was given orally. The patient was brought to the operating room and assisted into the semisitting position. The customary monitors were applied, including a pulse oximeter (Nellcor®) on the right index finger. Cannulae were then inserted under local anesthesia into the left radial artery as well as the right subclavian and saphenous veins.

Supplemental O₂ was administered by nasal cannulae until the % hemoglobin saturation reached 98 by pulse oximetry. Topical nasopharyngeal anesthesia was obtained with 20 ml of 1% lidocaine solution. Topical laryngotracheal anesthesia was produced by the transtracheal instillation of 5 ml of 4% lidocaine solution. Following the careful incremental administration of fentanyl to a total dose of 100 µg iv and 7.5 mg iv droperidol, fiberoptic tracheobronchoscopy was performed through the right nostril using a 5.7 mm OD Olympus® flexible bronchoscope while the patient breathed spontaneously. Bronchoscopy showed that the entire anterior surface of the thoracic trachea buckled inward during expiration and that the right mainstem bronchus was almost completely occluded at the carina throughout the respiratory cycle. The orifice of the left mainstem bronchus was slightly indented, but the remainder of that bronchus appeared patent during breathing. As the bronchoscope was withdrawn, an additional 10 ml of 1% lidocaine was applied to the trachea and larynx through its injection port. The patient tolerated the procedure well and maintained a % hemoglobin saturation of >97 by pulse oximetry.

A 39-Fr left-sided double-lumen tube (Broncho-cath®) was then passed orally under direct vision between the vocal cords and into the trachea while the patient maintained spontaneous respirations. The tip of the endobronchial lumen was positioned distal to the obstruction at the orifice of the left mainstem bronchus using a 4.2 mm OD Olympus® pediatric fiberoptic bronchoscope as described by Benumof.¹⁰

After tracheal intubation general anesthesia was induced by the inhalation of increasing concentrations of halothane in oxygen. Spontaneous respirations were maintained during an uneventful mediastinoscopy. Analysis of arterial blood obtained at this time (FI_{O₂} 1.0) revealed the following: PaO₂ 489 mmHg, PaCO₂ 61.8 mmHg, pH_a 7.38, and % hemoglobin saturation 100. Median sternotomy was then performed for better surgical access to the mediastinal mass. After the chest was opened ventilation was controlled. Analysis of arterial blood obtained at this time (FI_{O₂} 1.0) showed the following: PaO₂ 491 mmHg, PaCO₂ 45.7 mmHg, pH_a 7.48, and % hemoglobin saturation 100.

Following removal of 380 g of colloid adenomatous goiter, the chest wound was closed. The patient was allowed to resume spontaneous ventilation. Under pediatric fiberoptic control the double-lumen tube was withdrawn slowly and the entire tracheobronchial tree examined through the bronchoscope. The right mainstem bronchus and carina maintained normal configuration throughout the respiratory cycle. However, the anterior wall of the thoracic trachea appeared to collapse inward during expiration. The endobronchial tube was immediately repositioned in the left mainstem bronchus with fiberoptic guidance. The patient was sedated, and ventilation was mechanically assisted overnight.

On the first postoperative day the trachea was again inspected while the endobronchial tube was slowly withdrawn over the pediatric bronchoscope. The proximal 7 cm of the cervical trachea buckled with spontaneous inspiration, although the distal thoracic trachea now appeared structurally normal. With the surgeon in attendance, the double-lumen tube was removed, and under fiberoptic guidance a 9.0-mm armored endotracheal tube was positioned distal to the segment of cervical tracheal collapse.

On the second postoperative day while still intubated and undergoing mechanical ventilation, the patient suffered a sudden cardiac arrest. She died on the tenth postoperative day. Autopsy revealed a fresh transmural myocardial infarction and numerous small pulmonary

thromboemboli. Review of the hospital chart revealed no apparent cause for the myocardial infarction and no clues as to the time of its occurrence.

DISCUSSION

The potential hazards associated with the induction of general anesthesia in patients with an anterior mediastinal mass have been recently reviewed.⁷ If preoperative flow-volume loops reveal compression of the intrathoracic trachea,¹¹ radiation or chemotherapy should be instituted prior to anesthesia to shrink the mass and alleviate obstruction.¹² If, as in the current case study, these are not available options, fiberoptic bronchoscopy with the patient breathing spontaneously¹³ and monitored by pulse oximetry may be employed to assess both the functional anatomy of the entire airway and the response of the airway to changes in intrathoracic pressure. An awake tracheal intubation may then be possible with bronchoscopic confirmation of endotracheal tube placement distal to any area of obstruction. Such confirmation of position is essential if insertion of an endobronchial tube is considered necessary.¹⁴ Anesthesia may then be induced and the surgery may proceed with spontaneous respiration.¹⁵

In the patient described here the chances for an atraumatic passage and successful positioning of a right-sided endobronchial tube appeared remote in the presence of a completely obstructed right mainstem bronchus. A left-sided endobronchial tube was selected to function as a stent to preserve the patency of the partially occluded left mainstem bronchus. Fentanyl was chosen, even though respiratory compromise was present, because of the availability of a rapid-acting pharmacologic antagonist. Spontaneous respiration was employed to avoid the possibility of air trapping distal to the obstruction in the right mainstem bronchus.

The extension of an intrathoracic goiter into the cervical region may present a final hazard. The thoracic trachea may resume its original structure and integrity following surgical excision of the mass¹⁶ while the cervical trachea may collapse, producing immediate respiratory obstruction upon extubation.^{17,18} This presumably occurs because the negative pressure within the thorax maintains the patency of the trachea throughout the respiratory cycle while the softening of the extrathoracic trachea by the goiter allows atmospheric pressure to collapse the trachea during the inspiratory phase of respiration. As illustrated above, fiberoptic inspection of the entire tracheobronchial tree prior to removal of the endotracheal tube may permit detection of this complication.

In summary, the presence of an obstructing goiter in the anterior mediastinum offers obvious anesthetic challenges. Preoperative radiation therapy is ineffective in shrinking the mass to relieve airway compression. Flow-volume loops, if obtainable, give only an indirect indica-

tion of the degree of respiratory obstruction. Fiberoptic tracheobronchoscopy is essential for direct preanesthetic evaluation of dynamic airway anatomy and for accurate endotracheal tube placement at induction of anesthesia. This technique also facilitates assessment of the integrity of the entire tracheobronchial tree at the close of surgery. Appropriate measures may then be taken to assure airway patency in the postoperative period. A careful, deliberate approach to the induction and maintenance of anesthesia in such cases may avoid the need for emergent rigid bronchoscopy or cardiopulmonary bypass to alleviate precipitous respiratory obstruction.

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Postpartum Seizure after Epidural Blood Patch and Intravenous Caffeine Sodium Benzoate

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Postlumbar-puncture (PLP) headache after accidental dural puncture is a well-known complication of epidural analgesia for labor and delivery. The use of conservative

therapy and epidural blood patch for relief of PLP headache have been described previously.¹⁻³ We present a case of postpartum seizures temporally related to an epidural blood patch given to a patient for a PLP headache. This patient had failed conservative therapy, including epidural saline and iv caffeine sodium benzoate (CSB).

CASE REPORT

A 24-yr-old woman (G₃P₀Ab₁) was admitted while in active labor at 41 weeks gestation. Her prenatal course was uncomplicated. Her medical/social history was positive only for a brief episode of iv drug abuse 3 years prior. All prenatal laboratory work was normal. Baseline arterial blood pressure (BP) was 120/70 mmHg. Her admission examination showed a cervix 90% effaced and 3-4 cm dilated, BP 138/96 mmHg, reflexes 2+ and equal, no edema, and urinalysis negative for protein. She was given a 3.0 g magnesium sulfate iv bolus and started on a 2.0 g/h iv infusion. Her labor was also augmented with oxytocin.

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