

Only the J-tip of the wire guide should extend beyond the catheter during intravascular ECG monitoring because the catheter serves as electrical insulation for the rest of the wire guide (fig. 1). If the wire guide protrudes from the catheter, the electrical signal will not be localized to the catheter tip, but will enter the wire along the entire length which is exposed. As with any intravascular ECG monitor, the risk of electrical microshock must be considered.

In summary, I describe the use of a J-tipped wire guide as the intravascular ECG lead used for positioning a catheter precisely in the right atrium.

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## A Unique Method for the Anesthetic Management of Laryngeal Foreign Bodies

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Reports dealing with the diagnosis and management of patients with laryngeal foreign bodies are rare,<sup>1-4</sup> in spite of the fact that partial obstruction of the airway at the level of the larynx is a critical, potentially life-threatening, and challenging problem. The following cases illustrate the importance of good radiographic diagnosis and the heretofore unreported usefulness of a small cuffed endotracheal tube as an aid in the anesthetic management of foreign bodies aspirated into the larynx.

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### REPORT OF TWO CASES

*Patient 1.* A five-year-old boy arrived in the emergency room with aphonia, inspiratory stridor, and a history of recent aspiration of a thumb tack. The patient was apprehensive but rational, and vital signs were stable. No cyanosis was noted, and no blood was seen in the oral cavity. Frontal and lateral roentgenograms of the upper airway demonstrated the tack to be located in the larynx (fig. 1).

Due to concern that the tack would become dislodged and obstruct the airway, or that puncture of the nearby carotid artery might occur, the patient was taken directly to the operating room. An inhalation induction of anesthesia technique was fully explained to the patient. Induction of anesthesia was accomplished using 50 per cent nitrous oxide in oxygen and halothane. When consciousness was lost, an intravenous infusion was started. Anesthesia was deepened using 100 per cent oxygen and halothane with spontaneous respiration. When the patient was deeply anesthetized, direct laryngoscopy confirmed that the tip of the tack was imbedded in the trachea just below the true vocal cords and the head of the tack was in a vertical plane between the cords. Over the next five to ten min, using careful direct laryngoscopy, a 3.0 mm cuffed endotracheal tube was molded and remolded using a stylet until the tip of the tube passed safely around the tack and into the distal trachea. The cuff was inflated, and the patient was able to breathe easily. The tack was then removed with forceps using direct laryngoscopy. The patient's recovery was uneventful.

*Patient 2.* A 20-year-old retarded man had a sore throat, fever, inability to swallow and respiratory distress. He was quite anxious, sat in an upright position with his jaw thrust forward, and saliva drooled from his mouth. A reliable history could not be obtained. A roentgenogram of the lateral neck demonstrated a radiodensity in the area of the larynx, but a specific diagnosis was not established. With ventilatory support available, a xerogram (fig. 2) was performed, which demonstrated a bone sticking into the base of the epiglottis and extending into the larynx and upper esophagus.

The patient was taken to the operating room and an intravenous

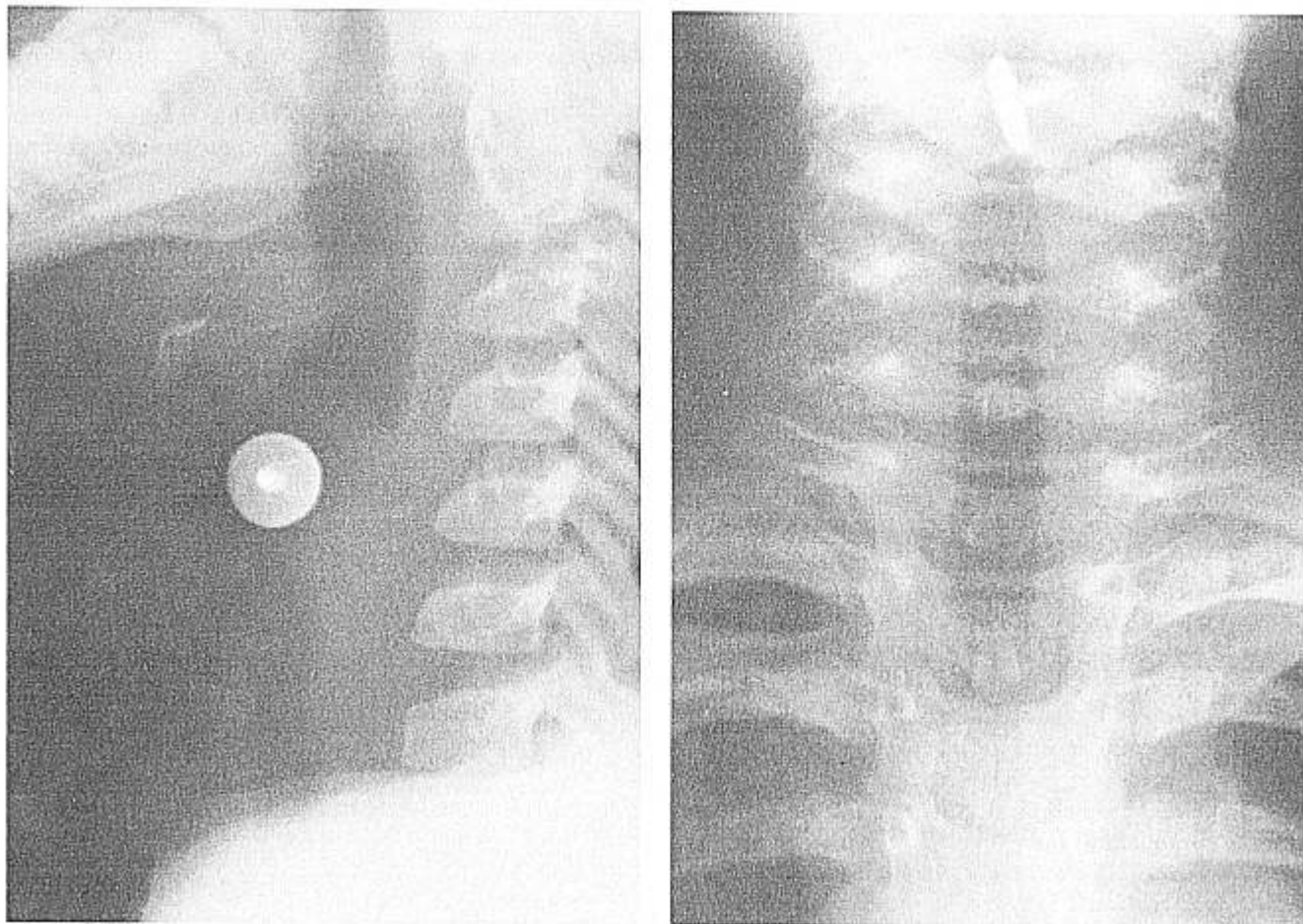


FIG. 1. Lateral and anterior-posterior roentgenograms of the neck in patient 1 showing the tack lodged in the upper airway at the level of the vocal cords.

infusion started without distressing the patient. Induction of general anesthesia using 100 per cent oxygen and halothane took approximately 20 min due to poor air movement past the obstruction. Spontaneous respiration was maintained. When the patient was well anesthetized, direct laryngoscopy was performed which confirmed the large bone to be stuck at the orifice of the larynx and extending into the esophagus. Marked swelling of surrounding tissues was present, and food from subsequent feedings had impacted onto the bone. Upon careful inspection, a small portion of the glottic opening could be seen lateral to the bone. A 5.0-mm cuffed endotracheal tube was conformed using a stylet in the manner described for the previous patient until the tip of the tube could be carefully passed around the bone and into the trachea. This process took ten to fifteen min during which spontaneous ventilation was maintained. The cuff was inflated and ventilation was adequate. Operative removal took 45 min, was associated with approximately 300 ml of blood loss, and required piecemeal removal of what proved to be a complete pork chop bone. Antibiotics were given intravenously and extubation of the trachea was performed after the patient was fully alert and stable. The remainder of his hospital course was uneventful.

#### DISCUSSION

Accurate diagnosis of the specific nature and anatomic location of an upper airway foreign body is desirable to

both the anesthesiologist and surgeon in the successful management of patients with this problem. The radiologist is a valuable consultant in selecting from among standard and newer radiologic techniques such as tomography, fluoroscopy, barium esophograms, frontal and lateral radiographs utilizing high kilovoltage and filtration,<sup>5,6</sup> xerography,<sup>7,8</sup> and even computerized tomography.<sup>9</sup> The roentgenogram in case 1 differentiated a laryngeal from an esophageal foreign body. Demonstration of a single tack large enough to completely obstruct the trachea located in a potentially life threatening position justified hastening the patient to the operating room where proper anesthetic and endoscopic equipment had been prepared. A coordinated preoperative plan between anesthesia and surgery facilitated a quick operative removal and shortened the time for complications to occur. In case 2, the roentgenogram differentiated between a foreign body in the airway and inflammatory disease. Without roentgenograms, an assumption that the patient had epiglottitis could have led to attempts at intubation which might have dislodged the foreign body, caused tube



FIG. 2. Lateral neck xeroradiograph of patient 2 showing part of the bone sticking cephalad into the base of the epiglottis (large arrow) and the remainder extending into the upper esophagus (small arrow).

misplacement, or further compromised the airway. Assuming a foreign body and attempting removal using a laryngoscope without knowing the size of the bone probably would have caused inability to later secure the airway due to swelling and bleeding.

Options for the anesthetic management of the types of patients presented in this report include: (1) tracheostomy under local anesthesia,<sup>10</sup> (2) awake oral or nasal tracheal intubation following topical anesthesia, (3) rapid sequence induction of anesthesia using barbiturates and muscle relaxants followed by intubation of the trachea, (4) inhalation induction of anesthesia followed by intubation of the trachea,<sup>11</sup> and (5) intravenous barbiturate induction of anesthesia followed by insufflation of anesthesia using a nasopharyngeal tube.<sup>12</sup> Possible complications of these methods include loss of airway control, inability to secure the airway with intubation of the trachea, uncontrolled bleeding, and precipitation of complete obstruction of the airway by dislodgement of the foreign body. Some methods, such as awake endotracheal intubation or tracheostomy under local anesthesia are frequently not practical in pediatric or retarded patients due to lack of cooperation. Gaudet *et al.* reviewing 123 cases of pediatric patients undergoing tracheostomy reported a complication rate of 33 per cent including four deaths.<sup>13</sup>

Because we were able to induce anesthesia by inhalation of halothane, the careful placement in the trachea of a small cuffed endotracheal tube was possible and offered several advantages. In the first case, the airway was protected below the foreign body by the cuff. This allowed for assisted ventilation, smooth maintenance of anesthesia, and protection of the lower airway from bleeding or obstruction from accidental dislodgement of the foreign body. In the second case, patency of the airway was necessary for a prolonged, complicated operative

extraction. A tracheostomy in this uncooperative patient may have resulted in complications.<sup>13</sup> Attempted removal of either foreign body through a bronchoscope would have left the airway open for possible complete obstruction and could have caused difficulties with maintenance of a consistent depth of anesthesia. Use of a rapid sequence induction of anesthesia would not have allowed time for a careful intubation of the trachea if manual ventilation was inadequate. Small pediatric endotracheal tubes with cuffs<sup>¶</sup> are marketed and should probably be available in anesthesia departments that have the potential for cases similar to these discussed. Torres and Reynolds<sup>14</sup> recently described the use of an elongated 4.0-mm cuffed endotracheal tube<sup>¶</sup> for use in microlaryngeal surgery. They demonstrated adequate ventilation and oxygenation in adolescents and adults using this tube.

In conclusion, an approach to the anesthetic management of laryngeal foreign bodies is presented stressing proper radiographic diagnosis and anesthetic management. Emphasis is placed on maintenance of the airway and use of small cuffed endotracheal tubes for securing the airway during operative extraction.

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