Diagnosis of Gastric Aspiration by Fiberoptic Bronchoscopy*

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At the time of bronchoscopic observation, 28 of 31 patients proved to have aspirated gastric contents by the presence of gastric contents in the trachea or by direct observation of gastric aspiration followed by respiratory distress and erythema of subsegmental bronchi. Since gastric aspiration is a difficult diagnosis to make and few objective data are available to make the diagnosis, the present study would indicate that early fiberoptic bronchoscopic observation of the tracheobronchial tree is a useful procedure to establish a definitive diagnosis and to allow proper planning for clinical management.

Pulmonary aspiration of gastric contents is a common, serious, and often fatal event. The exact frequency of aspiration cannot be ascertained because no specific method is available to diagnose the entity. Objective data for the diagnosis are not available in the medical literature.

In autopsy studies of patients who have aspirated gastric contents, epithelial destruction, hemorrhage, and acute inflammation have been described. Experimental studies have shown that the response of the tissue to entry of gastric contents into the lungs depends upon the volume of material aspirated, the presence or absence of particulate material, and the pH of the aspirate. The toxic effect of gastric acid in the lung has been equated with a chemical burn. Hemorrhagic tracheobronchitis has been described in experimental gastric aspiration; therefore, tracheobronchitis would be expected in gastric aspiration but would not by itself be adequate to establish the diagnosis, since several other causes of tracheobronchitis exist. When combined with the suspicion of aspiration in patients with predisposing factors, the observation of tracheobronchitis should be helpful. The findings reported here indicate the usefulness of bronchoscopic examination in the diagnosis of gastric aspiration.

**Materials and Methods**

The bronchoscopic findings in 57 patients with predisposing factors for gastric aspiration who were suspected of having aspirated gastric contents were examined. Because the diagnosis of gastric aspiration is difficult, the following strict criteria were used to select a subgroup of 31 patients: (1) the observation of gastric contents in the trachea during intubation, or (2) the direct observation of aspiration of gastric contents followed by development of respiratory distress. Only the 31 patients who met the strict criteria and who underwent bronchoscopic examination are reported in this study. At the time of bronchoscopic examination, 26 of the patients were being ventilated with a respirator (MA-1). Bronchoscopic observation was performed at times ranging from a few minutes to 48 hours after aspiration. One patient had a parenchymal infiltrate visible on the chest roentgenogram and had positive sputum cultures prior to gastric aspiration.

Of the 31 patients in this study, the following factors predisposing to gastric aspiration were found: drug overdose, seven patients; cardiac arrest, five patients; intubation, two patients; myasthenia gravis, two patients; alcohol intoxication, two patients; head trauma, two patients; bowel obstruction, two patients; seizures, two patients; tube feeding, one patient; Stevens-Johnson syndrome, one patient; brain tumor, one patient; cerebral hemorrhage, one patient; total-body burn, one patient; cerebral fracture, one patient; and toxic encephalopathy, one patient.

The chest roentgenographic findings included an infiltrate of five pulmonary lobes in 10 patients, an infiltrate with signs of volume loss in five patients, and localized infiltrates in one or more lobes in 11 patients (right lower lobe, nine; right middle lobe, seven; left lower lobe, four; right upper lobe, three; and left upper lobe, one). Five patients had no roentgenographic clue to aspiration.

The patient population was described by the mean values (±SE) for the initial (0.31 ± 0.04) and lowest (0.21 ± 0.02) arterial/alveolar oxygen tension ratio (upper limit of normal, 0.75), the mean number of days on the ventilator (4.7 ± 1.1), and the mortality (11/31). The presence or absence of erythema, edema, and ulceration of the tracheobronchial mucosa was also recorded.

**Results**

At the time of bronchoscopic examination, erythema was present in 28 of the 31 patients (sensitivity, 90 percent). Mild, marked, hemorrhagic, localized, and generalized erythema was noted in the peripheral (subsegmental) parts of the bronchial tree but seldom in the central bronchi. Figure 1

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Figure 1. A (left), Mild erythema in subsegmental bronchus of right lung observed by fiberoptic bronchoscopic examination two hours after gastric aspiration. B (center), Moderate erythema and edema causing blurring of bronchial anatomy in patient who had fiberoptic bronchoscopic examination performed three hours after gastric aspiration. C (right), Ulceration, edema, and severe erythema causing partial obliteration of bronchial lumen and extending beyond subsegmental bronchi in patient who underwent bronchoscopic examination two hours after gastric aspiration.

shows the mucosal appearance in three of the patients.

Eleven of 31 patients died following gastric aspiration. Autopsy findings in five of the patients who died were as follows: laryngotracheobronchitis, four patients; bilateral organizing pneumonia, two patients; pulmonary abscesses, two patients; focal bronchopneumonia, one patient; bronchopleural fistula, one patient; and emphysema, one patient.

Thirty-one consecutive bronchoscopic examinations performed in patients with diagnoses other than gastric aspiration who were being ventilated with a volume ventilator (Puritan-Bennett MA-1) were analyzed for the presence of erythema. Subsegmental erythema was not present in any patient in this control group. Even if the presence of erythema in any part of the tracheobronchial tree was used for comparison, there was a significant difference (P < 0.01) in the incidence of tracheobronchial erythema in the control group and that of subsegmental erythema in the group with gastric aspiration.

Discussion

The diagnosis of gastric aspiration has been hampered by the lack of objective signs that prove that gastric aspiration has indeed occurred. The stringent criteria (the observation of gastric contents in the trachea during intubation or the direct observation of the aspiration of gastric contents followed by development of respiratory distress) used in this study should leave little doubt that aspiration did indeed occur. The results of the study indicate that the presence of erythema in subsegmental bronchi may be an objective diagnostic criterion for gastric aspiration.

The observations of erythema suggest that fiberoptic bronchoscopic examination is a sensitive procedure for the diagnosis of tracheobronchitis due to gastric aspiration. Trauma induced by a suction catheter may cause mucosal abnormalities, but such trauma should cause changes in the central bronchi, not the more peripheral subsegmental bronchi as found in the patients in this study. To avoid possible confusion with catheter-induced trauma, blind suctioning of the trachea with a catheter should not be performed before bronchoscopic examination unless specifically indicated. Bronchoscopic procedures should be done soon after aspiration to avoid confusion with the mucosal changes caused by infection, which may develop later in the course of aspiration pneumonia.

Previous investigators have recommended bronchoscopic examination as an emergency procedure in the case of a particulate aspirate. Since the presence of a particulate aspirate is not always obvious from other clinical findings, bronchoscopic examination may be indicated to remove particulate matter if present. The use of the flexible fiberoptic bronchoscope is limited in the removal of gastric contents, as the size of the fiberoptic bronchoscope may be inadequate to allow removal of large particles. Use of the rigid bronchoscope might be necessary for this purpose. At the time of bronchoscopic examination, the observation of erythema in the presence or absence of particulate matter should then confirm the diagnosis of gastric aspiration.

References