

An Unusual Complication of Naso-enteral Feeding with Small-diameter Feeding Tubes

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The occurrence of nasotracheal intubation with feeding tubes of various types is well known but poorly documented. The small-diameter feeding tubes currently available for enteral hyperalimentation may be more prone to this complication because of their small size and the rigid guide wire which is required for placement. A high index of suspicion when placing these tubes in patients at risk, use of the wire guide to pass the nasopharynx only, and x-ray verification of tube location prior to usage should avert this potentially life-threatening mistake.

INCREASING EMPHASIS ON surgical nutrition has led to the development of new techniques and equipment. The use of soft small-diameter tubes for continuous infusion of liquid diets may be the most utilitarian of these methods. For the most part, their use is simple and associated with minimal morbidity. This report documents a potentially life-threatening complication associated with the use of such tubes.

Case Reports

Case 1. An 80-year-old black woman underwent resection of a malignant mediastinal thyroid carcinoma which was causing severe tracheal obstruction. After surgery, she suffered recurrent glottic obstruction and a tracheostomy was performed. The patient improved slowly but, because of recurrent aspiration, was unable to take a diet. A soft small-diameter nasogastric tube was placed and hyperalimentation begun. Feedings were proceeding uneventfully when the tube was accidentally removed. Another soft small-diameter tube was introduced through the nasopharynx. The patient experienced no immediate respiratory distress and did not cough or gag. The guide wire was removed and auscultation over the left upper quadrant revealed active bubbling upon insufflation. Tube feeding was restarted, and shortly thereafter the patient experienced severe respiratory distress and hypoxemia. A left-sided hydropneumothorax was seen on chest roentgenogram. The feeding tube could be seen passing down the left mainstem bronchus into the left pleural space (Fig. 1). Indeed, at the time of tube thoracostomy the feeding tube could be seen in the left pleural space. Closed drainage resulted in resolution of the hydropneumothorax with marked improvement in the patient's respiratory status. Empyema did not develop and the chest tube was subsequently removed. The patient eventually succumbed to widely metastatic undifferentiated thyroid carcinoma.

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Case 2. A 22-year-old black woman with multiple sclerosis experienced a rapid deterioration with respiratory collapse after a viral illness. A tracheostomy was required for long-term pulmonary management. A temporal lobe biopsy was positive for herpes immunofluorescence, and after treatment with Ara-A for 10 days some improvement was noted. Because of worsening malnutrition, tube feeding was begun. The nasoduodenal tube was accidentally removed and was replaced without apparent difficulty. The guide wire was removed and feedings were resumed. The patient soon experienced severe respiratory distress, and a chest roentgenogram showed a 100% right-sided pneumothorax (Fig. 2). There was no mediastinal or cervical air. The tube appeared to pass along the course of the trachea and right mainstem bronchus into the right pleural space. A chest tube was placed with complete re-expansion of the lung. Neither empyema nor mediastinitis developed, so the patient was returned to a local hospital for terminal care.

Case 3. A 29-year-old black man with severe Crohn's disease and ileocolonic stricture was undergoing nasoduodenal alimentation with low residue enteral formula when his small-diameter feeding tube was accidentally removed. The tube was reinserted using the wire guide. The patient experienced a mild dry cough during tube placement and, when tube feeding was restarted, he developed a productive cough, so the tube was removed. By morning he was febrile, and chest roentgenogram showed a right middle lobe infiltrate (Fig. 3). The feeding tube was replaced, its position verified radiographically, and feedings restarted. With conservative measures the infiltrate resolved over a 72-hour period, and the patient subsequently had no further pulmonary difficulties.

Comments

The increasing awareness of the importance of maintaining adequate nutrition in surgical patients has resulted in the development of many new techniques of both enteral and parenteral alimentation. One of these has been the increasing use of soft small-diameter feeding tubes for the purpose of long-term nasogastric or nasoduodenal alimentation by continuous infusion of a dietary formula. The problems associated with these devices usually involve tube occlusion by crystallized formula or inadequate tube position for feeding distal to the pylorus. The other major problem with these tubes has been the technical difficulty of passing the nasopharynx during initial introduction.

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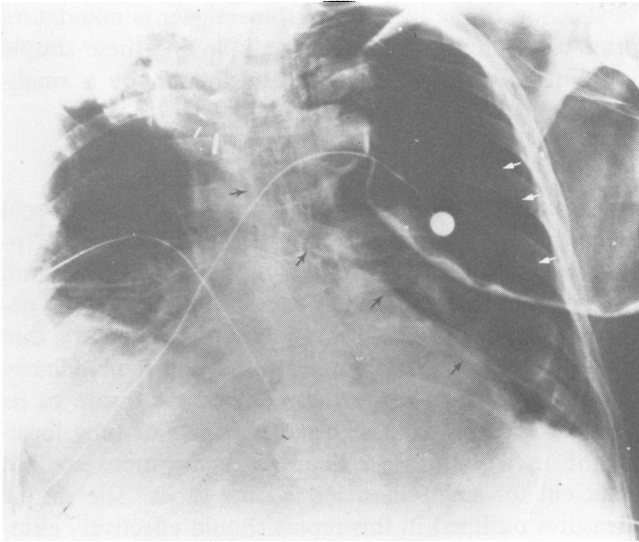


FIG. 1. Chest x-ray reveals left-sided pneumothorax (white arrows). The feeding tube can be seen passing down the left mainstem bronchus into the left pleural space (black arrows).

Some tubes are equipped with an intraluminal wire designed to provide rigidity and, presumably, to aid in passage of the tube.

In patients with compromise of tracheobronchial sensation due to chronic intubation, infection, or repeated nasotracheal suction, the small diameter of these tubes may allow undetected intubation of the airway and even intrapleural placement of the catheter. Because of the left-sided placement of the catheter in patient no. 1, insufflation of the catheter produced sounds over the left upper quadrant, and an intragastric position was assumed. It was not until respiratory distress supervened that the intrapleural location of the catheter was suspected. Patient no. 2 illustrates a similar situation where inadequate clinical evaluation following tube placement resulted in a life-threatening complication. The third patient illustrates that even those presumed not to be at risk because they have normal cough and gag reflexes may be subject to such a complication when poor technique and inadequate clinical assessment are combined in the management of a small-diameter tube.

Although this complication has been known to occur with the larger and more rigid tubes used for nasogastric suction and gavage feedings, to our knowledge, it has not been reported with a soft small-diameter feeding tube. The very nature of the tube, with its small caliber and soft, pliable construction, would seem to make endotracheal placement more likely. Inappropriate use of the rigid guide wire can then result in transmural passage of

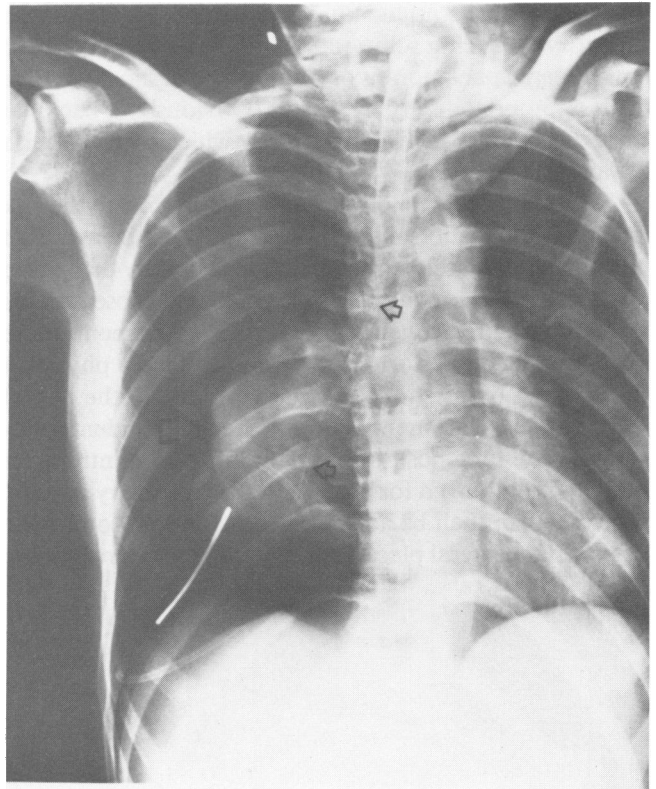


FIG. 2. Chest x-ray reveals complete right-sided pneumothorax (large arrow) with feeding tube (small arrows) passing down right mainstem bronchus into the pleural space.

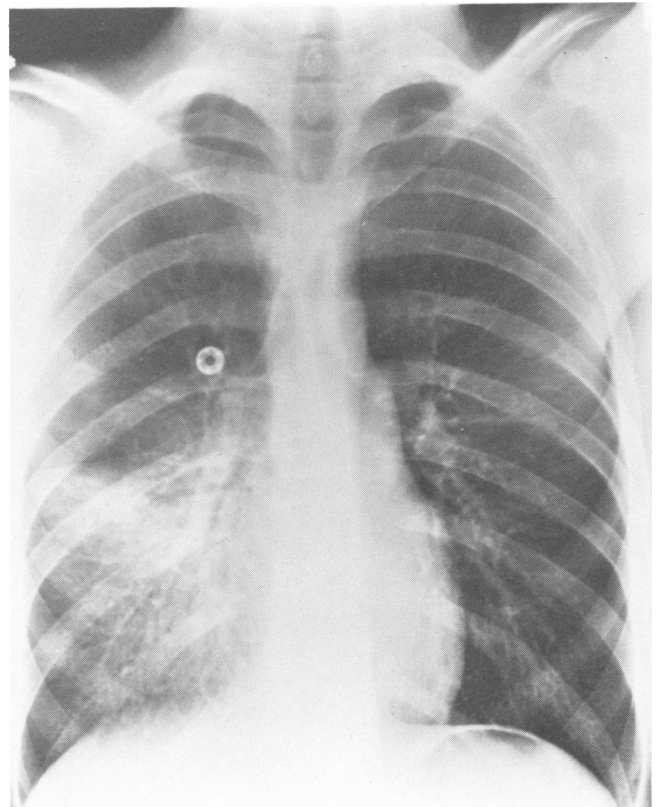


FIG. 3. Right middle lobe infiltrate noted in patient no. 3. Resolution occurred in 72 hours.

the tube with its attendant complications. Luckily, the majority of feeding solutions would be expected to cause only a sterile pneumonitis or pleuritis which should resolve with appropriate *early* treatment. Obviously, a bacterial superinfection is an ever present risk which increases with delay in recognition.

Several measures should be taken to minimize the risk of this complication. First, physicians must be aware of the possibility of this complication and identify that group of patients in whom the risk is increased, *i.e.*, those patients with an impaired cough reflex. Second, placement of the tube should be performed only under direct physician supervision by personnel who are attuned to the risk of endotracheal placement and who are able to identify inappropriate tube positioning. Third, the wire introducer should be employed for passage of the nasopharynx only. The tube can then be advanced over the wire to provide appropriate enteral placement. Finally, roentgenographic

verification of the location of the catheter is mandatory prior to beginning feeding. By employing these simple techniques, the risk of airway intubation by a small-diameter catheter is minimized.

Summary

The use of small-diameter nasogastric or nasoduodenal feedings tubes has increased rapidly in recent years. Un-suspected nasotracheal intubation by these tubes has not been previously reported but can occur, especially in patients with altered tracheobronchial sensation. The dire consequences of this complication make it mandatory that all physicians using these devices be aware of its possible occurrence. The usual methods of tube localization used with larger diameter sump tubes are not sufficient for small-diameter feeding tubes. The simple measures outlined in this report should effectively eliminate the risk of this complication.