Endotracheal Mass Resulting from a Transtracheal Oxygen Catheter

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A 50 percent or greater savings in oxygen usage and aesthetic benefits leading to increased compliance are reasons for increasing use of the transtracheal catheter for administration of home supplemental oxygen. Minor complications of the procedure are common and include catheter dislodgement, bronchospasm, subcutaneous emphysema, bleeding at the catheter site, as well as hemoptysis and wound infections. Rare complications include retroflexion of the catheter into the upper trachea from coughing, and fracture of the catheter with loss in the trachea. New, improved catheters and detailed descriptions for operator use may reduce the frequency of these complications. This report describes a potentially serious complication of a transtracheal catheter system which resulted despite appropriate use and care of the catheter.

Since the initial description of the chronic indwelling, transtracheal catheter for oxygen administration, several publications have described its application in patients with COPD. Catheters of various designs, and methods of insertion (percutaneous, subcutaneous tunneling) are gaining wider acceptance for use in the treatment of chronic hypoxemia of various causes. While the frequency of complications reported have been substantial, these have been minor and easily handled by observation, removal of the catheter, or antibiotics for infection. We describe high grade tracheal obstruction resulting from a mucus-inflammatory mass accumulating on the tip of a transtracheal catheter over a four-day period.

CASE REPORT

A 62-year-old man with a history of multiple spontaneous pneumothoraces beginning in 1963 was diagnosed as having chronic obstructive pulmonary disease in 1973. Exertional dyspnea was progressive despite discontinuation of smoking at the time of diagnosis. He had no other medical problems. One month before initiating continuous home oxygen therapy, the patient's arterial oxygen tension was 53 mm Hg and a repeat oxygen tension two weeks later was 44 mm Hg. Since the patient had no change in clinical symptoms suggesting acute exacerbation and was on maximal medical therapy at the time, continuous home oxygen was indicated. His life style was quite active so that a liquid oxygen system was prescribed. The insertion of a transtracheal oxygen catheter was recommended and accepted by the patient.

A SCOOP (Transtracheal Systems, Denver) transtracheal stent was placed using the techniques described in the ITOT manual. The procedure went smoothly and the patient returned home on the day of insertion using his nasal canula with oxygen flow at 3 L/min. He was seen seven days later. The wound was healing well, the stent was removed, and a SCOOP-1 catheter was inserted over a guidewire. He was instructed to use the catheter for oxygen administration and to clean the catheter with a 5 ml saline solution flush twice each day. He had no new symptoms at that time. His cough was mild and unchanged, with scant white sputum production.

Four days later (10th day following stent insertion), the patient's wife called saying that he had a violent coughing episode and "coughed the catheter into his throat." He developed severe dyspnea, inability to talk, and stridor. She had pulled the catheter out, to his immediate relief, and quickly reinserted the catheter without difficulty. The patient denied coughing anything up, and questioning revealed he was cleaning the catheter as instructed. Five days later, a similar episode occurred and his wife, acting as before, attempted to remove the catheter. The catheter came back two inches, but despite forceful traction, could not be extricated and further attempts at removal resulted in severe paroxysmal coughing and pain. The patient was comfortable and could speak with the catheter in place. He returned to the hospital immediately.

Attempts at removal of the SCOOP-1 catheter by "firm" external traction resulted in the symptoms described above. At fiberoptic bronchoscopy, the catheter position and internal tracheal orifice appeared normal. A large whitish brown mass was observed covering the distal catheter, occluding 75 percent of the tracheal lumen (Fig 1, inset). The mass abutted the posterior tracheal wall against a hyperemic area with a shallow central ulcer. During attempts to remove the catheter, the mass moved cephalad, but stopped at the internal tracheal orifice. Attempts at pushing the mass off the catheter with open biopsy forceps failed. The patient was instructed to take a deep breath. Using the open palm of the operator's hand, firm pressure was placed against the anterior neck with the catheter emerging between the fingers. A sharp jerk on the catheter dislodged it and the patient coughed out a 2.5 x 1.8 cm pecan-shaped mass (Fig 1). The catheter was cleaned and replaced. Since the tract was sufficiently formed to allow the patient's wife to replace the catheter, the patient was instructed to remove the catheter for cleaning on a daily basis to prevent further accumulations.

The mass was examined histologically using standard hematoxylin and eosin, periodic acid-Schiff, alcian blue, and Masson-trichrome stains. It showed concentric layers (Fig 1, center inset) of mucin between layers of a mixture of acute and chronic inflammatory cells imbedded in a homogeneous protein matrix. There were aggregations of red blood cells interspersed between layers.

DISCUSSION

The original description of this procedure by Heimlich listed "mild site irritation" and "occasional initial purulent

\[ \text{Figure 1. The } 1.8 \times 2.5 \text{ cm mass has been placed over the tip of a SCOOP-1 catheter reproducing the original relationship of the catheter to the mass. The upper left inset shows the mass in olio photographed through the flexible fiberoptic bronchoscope. The center inset is a periodic acid-Schiff stain of a portion of the mass showing concentric layers of mucin, protein, and inflammatory cells.} \]
drainage" as complications in 14 patients. The largest reported series of patients followed long enough to accumulate adequate experience with complications has been published by the same author. In a series of 100 patients, 10 percent developed subcutaneous emphysema, 3 percent skin infections responding to antibiotic therapy, 2 percent skin bleeding requiring cuticular suture, 6 percent hypercapnea due to probable "self-administration of excessive oxygen flows," and 3 percent excessive mucous production. Infections associated with the catheter include cellulitis which is often due to *Staphylococcus aureus*. Other reported complications include coughing the catheter into the upper airway, breaking off catheter parts into the trachea, transient hemoptysis, and mucous balls adherent to the catheter.

None of these complications appears to be of a serious nature and most are reversed after simple observation, administration of antibiotics, or if severe or persistent, removal of the catheter. We believe that the complication described in this report is potentially serious and physicians working with intratracheal catheters should be aware of its possibility. The size of this mass at removal was sufficient to completely obstruct one of the mainstem bronchi had it broken loose from the catheter. Another day or two of growth and this mass would have severely compromised tracheal airflow and might have been too large to be expelled through the vocal cords.

The histologic composition of this mass indicated that it was not simply a "mucous ball" as described in the ITOT manual. In addition to mucin, it contained large areas of protein, inflammatory cells, and blood, and originated adjacent to an ulcerated area of the mucosa. We believe that it formed from a combination of inspissated mucus and inflammatory protein secretions from the ulcerated posterior tracheal wall. This is compatible with the patient's clinical history of minimum sputum production and no increase in cough or dyspnea except for the two reported coughing paroxysms.

We can offer no specific suggestion for prevention of this complication, as saline irrigation did not hinder its formation. Also, the main portion of the mass formed proximal to the single, distal SCOOP-1 port. Bulky mucous collections are most likely to occur during tracheal maturation since patients do not remove the catheter. Accumulations of mucus adherent to the SCOOP-2 catheter would not become apparent since the catheter is removed twice daily (after tracheal maturation) effectively stripping any accumulated mucus and preventing concretions. During the stent and SCOOP-1 phase of tracheal maturation, patients should be cautioned to seek follow-up for any unusual hoarseness, stridor, or inspiratory wheezing, or for change in usual coughing pattern as indicated in the ITOT manual. In case of marked resistance to catheter extrication, perhaps further attempts at removal should be done in a controlled medical environment. We believe the tracheal catheter remains a safe route of oxygen administration and a promising method of improving patient compliance.

REFERENCES


Bronchial Stenosis after Aspiration of an Iron Tablet

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Stenosis of the right intermediate bronchus was found in a 60-year-old woman four months after aspiration of an iron tablet. Right middle and lower lobe lobectomies were performed. By light microscopy, small amounts of foreign, iron-positive material surrounded by giant cells, large collections of hemosiderin containing macrophages, and severe fibrosis with only minimal inflammation were observed in the bronchial wall. Early diagnosis and management are stressed in order to avoid the stenosing process which is also possible after aspiration of some tablets.

Bronchial stenosis is a well known complication of granulomatous infection. After aspiration of foreign bodies, and especially of drugs, it has been rather rare. Tracheal and bronchial strictures due to other mechanical causes such as compression of long-lasting intubation of cuffed tube tracheostomy are well documented. A patient developing bronchial stenosis after aspiration of an iron tablet is presented and the literature concerning this topic is reviewed.

CASE REPORT

A healthy 60-year-old woman used iron tablets containing 100 mg ferrous sulphate each for mild anaemia. She aspirated one tablet in January 1985 and immediately after that, had a feeling of choking accompanied by heavy cough irritation for many hours and wheezing in breathing. A chest x-ray film taken the same day was normal. Because the symptoms such as cough and wheezing continued for