Respiratory Failure and Cor Pulmonale Associated with Tracheal Mucoid Accumulation from a SCOOP Transtracheal Oxygen Catheter*

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Transtracheal oxygen (TTO) delivery for patients with chronic hypoxemia has been used increasingly since its introduction in 1982. Most complications have been relatively minor and usually occur in conjunction with catheter placement. This report describes two patients with long-term catheter use who developed increasing respiratory failure and cor pulmonale, at least in part, due to a large tracheal mucus plug.

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ABG = arterial blood gas; TTO = transtracheal oxygen

The use of transtracheal catheters for the long-term delivery of oxygen has become increasingly popular in the treatment of patients with chronic hypoxemia. The advantages of this type of oxygen delivery include a reduced oxygen requirement, the amelioration of dyspnea, the elimination of nasal irritation, an improved appetite, and an increase in mobility. While a number of complications have been described, the majority of them are minor and occur during or soon after catheter placement. We describe our recent experience with two patients having a SCOOP II catheter for at least one year who presented with increasing respiratory failure as a result of partial tracheal obstruction caused by a large mucus plug.

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CASE 1

A 58-year-old white man had chronic bronchitis, pulmonary asbestosis, and Crohn's colitis. One and one-half years previously he was started on oxygen therapy at 5 L/min because of severe hypoxemia with cor pulmonale following which arterial blood gas (ABG) values showed a pH of 7.40, PaO2 of 55 mm Hg, and PaCO2 of 38 mm Hg. Six months later, a transtracheal oxygen (TTO) catheter (Transtracheal Oxygen Systems) was placed uneventfully. The SCOOP II catheter was removed and cleaned twice daily and the patient remained clinically stable on a regimen of oxygen at 3 L/min, spironolactone 25 mg three times a day, furosemide 40 mg every other day, and sulfasalazine 1 g every day.

Two months prior to hospital admission, the patient developed increasing dyspnea and edema and eventually was hospitalized. The ABG values showed a pH of 7.37, PaO2 of 48 mm Hg, and PaCO2 of 41 mm Hg with 5 L O2 via his TTO catheter. The chest roentgenogram showed only chronic changes of interstitial fibrosis, pleural thickening, and diaphragmatic calcification, and the normal flora grew from the sputum.

The patient was treated with bronchodilators and his oxygen flow was increased to 6 L while his twice daily tracheal catheter care of removal and cleaning continued. He required doses of furosemide up to 100 mg intravenously, along with metolazone, 5 mg every day and spironolactone 50 mg twice a day to achieve a diuresis that finally began after six days. He lost 4.5 kg over the next three days, but on the eighth hospital day, he became increasingly dyspneic. A lower extremity venous Doppler examination and a lung scan suggested neither venous thrombosis nor pulmonary emboli. Steroid therapy was begun without improvement.

The patient continued short of breath for 24 h and subsequently developed stridor whereupon he expectorated a huge mucus plug (approximately 15 x 45 mm) that caused prompt symptomatic relief of his dyspnea. The diuresis continued and he lost 11.7 kg over the next nine days. He was discharged on a regimen of oxygen at 5 L/min, furosemide 40 mg every day, and spironolactone 25 mg three times a day. Over the ensuing six months, there has been no further problem with mucus balls, his level of dyspnea, or edema.

CASE 2

A 51-year-old white female smoker had severe pulmonary emphysema and FEV1 of 0.4 L. The patient has required oxygen for 3½ years and 2½ years ago had the creation of a tracheocutaneous fistula for TTO delivery. Despite assiduous catheter care, she intermittently noted the accumulation of mucus balls.

The patient was recently admitted to the hospital with increasing dyspnea and had diminished basal breath sounds. Initial ABG values showed a pH of 7.34, PaO2 of 108 mm Hg, and PaCO2 of 74 mm Hg with oxygen at 1.5 L. A chest roentgenogram showed severe emphysema without an acute infiltrate. Initial treatment consisted of intravenous theophylline, steroids, and cefuroxime, as well as nebulized albuterol and glycopyrrolate. A Pseudomonas species grew from the sputum culture; however, a follow-up specimen had normal flora, although the antibiotic was unchanged.

On the second hospital day, the patient coughed up a large mucus plug (Fig 1) with significant relief of her dyspnea. A subsequent bronchoscopic examination showed neither granulation tissue at the TTO site on the inner tracheal wall nor additional mucus plugs. The catheter was withdrawn during the examination and a stripping action was observed causing a 1-cm glob of mucus to accumulate at the TTO entry site. The remainder of the patient's hospital course was unremarkable; however, following hospital discharge, the patient continued to have problems with mucus balls and recently discontinued using her TTO catheter.

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FIGURE 1. Mucus cast expectorated from the trachea of case 2; note "dimple" (just below arrow tip) that is presumed to be caused by the catheter.

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DISCUSSION

Several articles have recently discussed an extensive experience in the delivery of oxygen by the transtracheal route.4,5 The problems associated with this technique are not infrequent and include subcutaneous emphysema, infection at the insertion site, catheter malposition and fracture, and the accumulation of mucus balls.6,7 One report suggested that mucus plugging may be a problem with the SCOOP system since it employs a wider-gauge catheter having multiple side vents,8 while another indicated that catheters designed for infrequent change are prone to clog at the tip.9 Although the occurrence of large mucus plugs has not been noted with the use of small-diameter catheters having a single terminal opening, there has been a recent case10 in which a SCOOP I catheter could not be removed because a large mass of inspissated mucus and inflammatory tissue became adherent to its distal end.

SCOOP catheters in 30 of our patients have generally been well-tolerated; however, others have reported the stripping of mucus into the trachea and the need for frequent catheter cleaning and removal.11,12 The two patients described in this report appear to have developed late complications requiring hospitalization in large part due to the accumulation of inspissated mucus in the trachea despite twice daily removal and cleaning of their catheters. In the first case, stridor was noted shortly before the mucus plug was expectorated while in the second, hypoventilation may have prevented sufficient airflow to generate tracheal noise. A retrospective review of the hospital admission chest roentgenograms with particular attention to the tracheal air column did not suggest any compromise of the lumenal diameter.

Unfortunately, the direct visualization of a large tracheal mucus cast was not bronchoscopically verified so we cannot be certain that the plug was initially present. The temporal sequence of dramatic improvement following the expectoration of a huge mucus glob, however, suggests that tracheal obstruction by this mass played a crucial role in the patients' respiratory compromise. Also noteworthy was the fact that the plug remained within the trachea despite the regular removal and cleaning of the TTO catheter. The "dimple" noted at one end of the cast expectorated by case 2 suggests that the catheter's entrance position in the trachea may have been the nidus for the mucus accumulation. Alternatively, it may simply have been due to catheter tip pressure on the mucus after it had been stripped off. Bronchoscopy was performed to determine if granulation tissue was present at the TTO site and while none was seen, catheter extraction during the examination induced a stripping action that caused a 1-cm-sized mucus plug to develop at the tracheal entry point.

We have described two patients who have suffered significant late clinical complications caused by a large mucoid accumulation in the trachea following the placement of a SCOOP transtracheal catheter. We suggest that patients admitted to the hospital for respiratory failure or increasing cor pulmonale who are receiving oxygen via TTO catheters may benefit from bronchoscopy to rule out tracheal mucoid obstruction if the response to an appropriate therapeutic regimen is unsatisfactory.

REFERENCES


Transmission of Tuberculosis to Hospital Workers By a Patient with AIDS*

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A patient with acquired immunodeficiency syndrome (AIDS) was admitted to a hospital with cough and fever and after 29 days was transferred to a hospice. He was eventually shown to have active pulmonary tuberculosis. This diagnosis was obscured clinically by simultaneous infection with Pneumocystis carinii and Mycobacterium avium complex (MAC). Laboratory recognition of Mycobacterium tuberculosis was delayed because of overgrowth of cultures by MAC but was later established using DNA probe techniques. Thirty (19 percent) of 158 health care workers who had been exposed to this patient had conversion of their tuberculin skin tests. Diagnostic difficulties and nosocomial transmission of tuberculosis may occur when patients with AIDS have mixed mycobacterial infections.

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DNA = Deoxyribonucleic acid; HIV = human immunodeficiency virus; MAC = Mycobacterium avium complex; MTB = Mycobacterium tuberculosis

Patients with acquired immunodeficiency syndrome (AIDS) are predisposed to infection with a variety of organisms which usually pose no threat to healthy care-

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