COMMENTARY  This commentary provides editorial perspectives on the report which follows

A Tale of Two Brushes

L. Jack Faling, M.D., F.C.C.P.*

The isolation and identification of a specific bacterial pathogen permits appropriate antibiotic management of patients with suspected lower respiratory tract infection. The need for a diagnostic technique which provides uncontaminated lower airway secretions was stressed in a recent editorial in Chest.1 While transtracheal aspiration and percutaneous needle aspiration of the lung fulfill this requirement, these methods are sharply invasive, occasionally cause death or life-threatening complications, and most importantly, have not gained wide acceptance even though they have been available for several decades.

Fiberoptic bronchoscopy is an attractive alternative for evaluating pulmonary infections because of its widespread use and safety. Unfortunately, secretions routinely obtained by this approach are unsatisfactory due to contamination of the instrument by oropharyngeal bacteria during passage through the upper airways.2 The recent development of a plugged telescoping catheter (PTC) brush3 (BFW brush, Medi-Tech, Watertown, Mass) offers a solution to this problem. Rigorous in vitro testing showed the telescoping catheter to be superior to a single catheter with or without a distal plug, or to a nonplugged double catheter. This protected brush was also found to be effective in sampling sterile lower respiratory secretions from normal volunteers, and in diagnosing lower respiratory tract bacterial infection in a small group of patients. More recently, the efficacy of this catheter was further demonstrated in a group of 50 patients; quantitative cultures yielded one or more potential pathogens in high colony count in 34 instances.4 In nine of these 34 patients, the same organism was isolated from blood cultures, a surgical specimen, or by transtracheal aspiration, and all 34 patients responded to antimicrobial therapy directed against the predominant pathogen(s). Fourteen of the 16 patients with insignificant growth on culture either had a final diagnosis of nonbacterial lung disease or had received effective antimicrobial therapy prior to their brush study. Legionnaires' disease and pulmonary tuberculosis were diagnosed in the final two patients by other means; culture of the brush for the responsible organisms was not attempted, however.

Methodologic details are important to insure reliable results with the PTC brush. Aerosol anesthesia with 15 ml of 2 to 4 percent lidocaine is performed because the injection of fluid through the inner channel of the bronchoscope washes large numbers of oropharyngeal bacteria into the lower airways.5 A system for quantitative bacterial cultures is mandatory since low concentrations of contaminants are frequently recovered following brushing, making qualitative bacteriology uninterpretable. Because quantitative cultures of serial dilutions are complex, time consuming, and unacceptable for most clinical laboratories, the use of a 0.01 ml calibrated loop, analogous to that employed for urine cultures, is currently being studied (Neil Wimberley and John Bass, personal communication).

Other details of the PTC brush procedure deserve mention; their importance in accurately assessing lower respiratory tract bacteriology is less certain, however. Atropine is given to decrease the quantity of saliva. Upper airway secretions are not suctioned into the inner channel of the bronchoscope prior to collecting the brush specimen, and the outer and then the inner catheters are extended for a total distance of 3 to 4 cm beyond the bronchoscope prior to advancing the brush to avoid pooled secretions at the instrument tip. Following removal of the protected brush unit from the bronchoscope, the distal portion of the inner catheter is wiped clean with 70 percent ethanol, and the distal inner catheter and finally the projected brush are severed with sterile instruments.

In this issue of Chest (see page 157), Teague and

*Pulmonary Service, Boston Veterans Administration Medical Center; Associate Professor of Medicine, Tufts University School of Medicine.
colleagues describe their experience using a single sheathed, nonplugged sterile brush and quantitative culture techniques in assessing possible lower respiratory tract infection in 55 patients. Their results were surprisingly good in view of the unsatisfactory in vitro evaluation of this catheter.3

This has important implications since the unplugged brush catheter is less expensive (approximately $8.00) and somewhat easier to handle than the PTC brush ($12.00). It should be pointed out that because of methodologic differences, the concentration of $\geq 10^6$ colonies per ml considered indicative of infection by Teague et al is roughly equivalent to our requirement of $\geq 10^8$ colonies per ml.

Teague and his co-workers5 claim that insertion of their brush into the infected site with fluoroscopic confirmation is the important aspect of the procedure which permits optimal results. Unfortunately, they do not prove this point because they failed to culture secretions from a more proximal area of the bronchial tree. We suspect that the requirement of fluoroscopy, with its potential for delay and inconvenience, will make the sheathed nonplugged brush more expensive in the long run than the PTC brush which is positioned by direct vision in the bronchial orifice of the roentgenographically abnormal lobe. Fluoroscopic placement also necessitated the additional bronchoscopic instillation of lidocaine (Xylocaine) in an unspecified number of patients, enhancing the risk of lower airway contamination.

While flexible bronchoscopy can be a successful adjunct in diagnosing pulmonary tuberculosis,5 there seems to be little need to obtain uncontaminated specimens in patients with suspected mycobacterial disease unless a bacterial or a mixed bacterial-mycobacterial infection is considered likely. Mycobacteria are readily recognized as potential pathogens and there are good selective culture media to inhibit competing flora. The same argument can be applied to patients with suspected pulmonary infection due to the pathogenic fungi.

The bacteriologic findings in patients with unsuccessfully treated lung abscess are puzzling. These nine patients all cultured $\geq 10^6$ colonies per ml with multiple organisms in seven instances. The literature on transtracheal aspiration indicates that once an antibiotic has been given, the ability to recover a sensitive organism is markedly reduced.6 Were antibiotic-resistant strains present in these cases? This is a possible explanation, but the authors do not address this issue. Contamination of the brush during the procedures, or failure of antibiotics to penetrate into these abscesses are alternative explanations.

As pointed out by Teague and his colleagues,5 the sterile brush catheter, like transtracheal aspiration, should not be employed in the diagnosis of routine bacterial pneumonias. Clinical use of the sterile brush should be restricted to those patients with suspect bacterial infection who fail to produce sputum, demonstrate inconclusive or confusing findings on sputum Gram stain and culture, are candidates for unusual infections, or fail to respond to antimicrobial therapy.

Proper use of the PTC brush or the shielded, nonplugged brush described in the present paper requires the operator to become experienced with the techniques and to use either of these procedures according to their original description. The microbiology laboratory must also be willing to do the necessary cultures in a quantitative fashion. Conflicting results using modifications of the prescribed schema will only cloud the issue. Clinical studies comparing these two brushes with each other and with alternative methods for obtaining uncontaminated lower airway secretions seem justified.

References

1 Unger KM. Sputum or spit? Chest 1979; 76:498-500