also, various attempts were made starting with the pioneering work of Montgomery and the use of the silicone T-tube. Although the insertion of this type of stent was done under endoscopic control, it also necessitated tracheostomy for security of ventilation and maintenance of the tube in place. The Toronto thoracic surgery group reported their extensive experience with modifications of the silicone T-tube, inserted endoscopically and in some cases without tracheostomy. Other types of metallic stents were placed by Clark with the rigid scope, but not under visual control. These were modifications of spiral tubes designed initially for esophageal dilatation. In this work and the work by Orlowski, who used modified tracheoflex tracheostomy tube and maintained optical control, the treatment was aimed at palliation of airways obstruction due to neoplasms.

Undeniably, most patients with lung cancer die from respiratory complications (infections, hemoptysis, etc). However, the most distressing and the most painful complication for the patient and the family is suffocation. This is where the new stents presented to us in this issue of Chest (see page 328) by Dumon might play a major role. In evaluating this technique, we have to remember the risks of accumulated inspissated secretions and the danger of displacement of the stent and of its rapid obstruction by overgrowth of the proximal or distal rims by active tumor or edema. Dumon's new devices originated from his superb single-handed endoscopic experience. The difficulties encountered in management of airways obstruction prompted him to develop the dedicated tracheobronchial stents without necessity for tracheostomy.

The rapid expansion of bronchoscopy from a diagnostic to a highly interventional and therapeutic modality requires that the otolaryngologist, thoracic surgeon, and/or pulmonary specialist be a well-trained endoscopist and capable of handling eventual bronchoscopic difficulties so as to minimize complications. Techniques for placement of stents, such as those developed by the Marseille group, will have to be mastered and will join other therapeutic modalities such as lasers and brachytherapy. Other major skills developed by tracheobronchial endoscopists are maintenance of good control of ventilation, manipulation of various instruments, and accurate visual assessment. At the present time, in spite of many optical improvements, we are limited to a two-dimensional picture through the scope. It is only through experience that the endoscopist can develop a proficiency in approximate assessment of the diameter and length of obstructed segments. This honed skill will obviously play a role in the choice of appropriate size and length of the stent. All this adroitness is magnified in the Dumon technique where the actual placement of the stent is done without direct visual control. I am hopeful that new diagnostic modalities in the form of endoscopic interferometry, ultrasonography and others will help us in this task in the not very distant future.

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A Ghost from the Past
Low Tidal Volume Mechanical Ventilation Revisited

It has long been recognized that monotonous spontaneous or mechanical ventilation with a low $V_R$ (5 to 7 ml/kg) of normal or minimally damaged lungs allows the development of alveolar atelectasis. As a result, an increase in intrapulmonary shunting and a decrease in lung compliance and $P_aO_2$ occur. These effects can be reversed by inflation of the lungs with a larger $V_T$ presumably by reopening atelectatic alveoli. This led to the practice of providing periodic larger breaths, or sighs, while mechanically ventilating patients in respiratory failure with a low $V_T$. Subsequently, it was demonstrated that constant mechanical ventilation with a large $V_T$ (10 to 15 ml/kg) also forestalled the development of atelectasis and increased intrapulmonary shunting, and periodic sighing fell into disuse. Nevertheless, the custom of using a
large VT during mechanical ventilation continues today despite the application of positive end-expiratory pressure (PEEP), another modality that prevents alveolar atelectasis in most patients with acute respiratory failure.

The concomitant use of a large VT and PEEP may be deleterious. Airway pressures are higher and can result in greater barotrauma. In patients with acute respiratory failure requiring high levels of PEEP, mechanical ventilation with a large VT reduces static lung thorax compliance in comparison with ventilation with a low VT. The reduction in compliance with the use of a large VT signifies overdistention of the lung at end-inspiration. As a result, pulmonary vascular resistance and physiologic dead space may increase. In addition, recent studies in experimental animals suggest that extremely high airway pressures resulting from use of a large VT actually produce lung injury.

In this issue of Chest (see p 430), Lee and colleagues report the results of a study in which patients in a surgical intensive care unit (ICU) were randomized to receive mechanical ventilation with PEEP using a large VT (12 ml/kg) or low VT (6 ml/kg). They found no major adverse effects from using a low VT. Although arterial oxygenation was slightly worse with a low VT, it was of little clinical significance. Furthermore, trends were noted for a lower rate of pulmonary infections and shorter durations of intubation and ICU stay. These results potentially have important implications for the current management of patients receiving mechanical ventilation. Before these findings are applied to all mechanically ventilated patients, however, additional data should be obtained from other patient populations. Many of the patients studied by Lee et al were ventilated after having undergone elective thoracic or abdominal surgery and presumably did not have severe parenchymal lung disease. The average maximum peak airway pressure and PEEP used in the low VT group were only 28.9 and 7.2 mm Hg, respectively. Therefore, whether the observations of Lee et al will be applicable to patients with severe ARDS, obstructive airways diseases, or primarily unilateral disease processes is not clear. Inasmuch as there was no greater amount of barotrauma in the large VT group, it also is not obvious why use of a low VT should result in trends toward a lower rate of pulmonary infections and shorter durations of intubation and ICU stay. Furthermore, hyperventilation in head injury patients was not possible with a low VT using acceptable (<26 breaths/min) ventilator rates.

Nevertheless, it appears that we have completed a full circle. In mechanically ventilated patients, if PEEP is used to prevent atelectasis in those with relatively normal lungs and to increase functional residual capacity in those with parenchymal lung disease, the ghost of mechanical ventilation with a low VT may be in the midst of a reincarnation.

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