necessary safety measures for operating electrosurgical units via the fiberoptic bronchoscope. The report of Hooper and Jackson, although preliminary, should provide a stimulus for further investigation on the feasibility of electrosurgery via the fiberoptic bronchoscope as a safe procedure with useful therapeutic application.

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REFERENCES

The Use of Lasers in Thoracic Surgery

Application of the laser in medicine continues to expand in various specialties including bronchology and, most recently, thoracic surgery. Endoscopic application of laser technology began in 1973 with use of the carbon dioxide (CO2) laser to ablate benign lesions, such as tracheobronchial papilloma and, later, to palliate malignant obstruction of the airway.1,4 However, problems associated with a somewhat cumbersome arm mirror-to-lens delivery system and the limited hemostasis associated with the CO2 laser prompted application of the neodymium-yttrium aluminum garnet (Nd-YAG) laser in bronchology.2,4 With its superior hemostatic qualities, the Nd-YAG laser can be delivered through a flexible quartz fiber that is easily passed through standard or somewhat modified flexible and rigid fiberoptic bronchoscope systems. Large series of patients with malignant tracheobronchial obstruction have undergone successful palliation with minimal rates of morbidity, according to reports by a number of investigators5-8 in Europe and the United States.

Applications of the laser in thoracic surgery to seal lung tissue during open operation and perhaps through a thoracoscopy approach are promising areas of investigation. In this issue of Chest (see page 820), LoCicero et al clearly show that, when used in a defocused manner, the CO2 laser can "weld" small (1 mm by 3 mm) holes in lung tissue with minimal pleural adhesion. However, defects of this size are of no clinical consequence in thoracic surgery since they seal spontaneously. Laser technology would be of value in the treatment of spontaneous pneumothorax if it can be used through a thoracoscopic approach. Open transthoracic bleb resection using staplers or suture combined with pleurectomy or pleural abrasions is highly successful, and the use of expensive laser technology and longer hospitalization in this setting are unwarranted.

On the other hand, the authors point out three uses of the laser in pulmonary surgery that have great promise. The first of these is subsegmental resection of solitary pulmonary nodules or multiple metastatic lesions. With the use of the laser, such lesions with adequate histologic margins might possibly be removed in a corelike fashion, without sacrificing a considerable amount of surrounding lung tissue. The second potential use is in pulmonary lobectomy when an incomplete fissure is present. A stapling device, which is often used in such situations, may cause unnecessary distortion of the lung. Laser dissection might also be useful in segmental lung resection, a procedure often associated with prolonged leakage of air. The third potential application is thoracoscopic lung biopsy in immunocompromised patients, using the laser either to seal an area of forceps biopsy or as a cutting device to perform the biopsy.

Questions may arise, such as, "Is this the right laser?" and "How does this procedure compare with electrocautery, which is a lot less expensive?" Experimental work by Wolfe et al9 indicated that effective control of air leaks was achieved with less tissue necrosis using the Nd-YAG laser compared with electrocautery. The Nd-YAG laser is a better coagulator of tissue than the CO2 laser, perhaps providing more secure welding of the lung.

These innovative approaches using laser technology both endoscopically and externally through thoracotomy and, perhaps, through thoracoscopy show great promise and deserve further study. The burden of proof is on the investigator to demonstrate that the laser is more than just an expensive high-tech scalpel and that it is superior to conventional techniques.

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REFERENCES
The Case for Continued Scrutiny of Catheterization-Related Complications

The expanding indication of cardiac catheterization as a therapeutic modality is increasing the use of the cardiac catheterization laboratory in the 1980s. Therefore, it seems appropriate to review the complications of cardiac catheterization and angiography at this time. The most comprehensive data available are those of the Registry Committee of the Society for Cardiac Angiography, reporting 53,581 patients who were studied prospectively, and the recently completed Coronary Artery Surgery Study (CASS) of 7,553 consecutive patients. The mortality rate ranged from 1 to 2 percent. Factors which predisposed to higher mortality included the brachial artery approach, ejection fraction of less than 30 percent, left main disease, functional class 4 angina, valvular heart disease, and age (less than one year or greater than 60 years). In particular, children less than one year of age had a 1.75 percent mortality; however, the latter generally reflects a complex, moderately-ill subset of patients.

Other serious morbidity included myocardial infarction (0.07 to 0.25 percent), peripheral or central nervous system emboli (0.07 to 0.09 percent), ventricular fibrillation (0.3 to 0.6 percent), and other vascular complications such as thrombosis or dissection of the brachial or femoral arteries (0.5 to 0.6 percent). These findings are comparable to those of other series.

Several issues deserve emphasis. The overall risk of serious complication (i.e., cerebrovascular accident, myocardial infarction, or death) has been reported to be 1.3 percent, but as Schroeder points out, many complications go unrecognized or are not reported, and as many as 16 percent of patients sustain complications which require therapy or prolong hospitalization. In CASS, vasovagal episodes were not reported as complications, whereas in another series this was the most frequent complication of angiography, accounting for 54 percent of all complications.

In the CASS group, the routine use of heparin did not affect morbidity or mortality; however, others have reported its use to have significant impact and its use should be encouraged.

The presence of significant left main coronary disease has, in early series, been reported to have a high catheterization-related mortality as high as 15 percent in one series. Others, however, have shown that such patients can be studied with low morbidity and mortality. Recent data confirm that these patients remain at higher risk, with a 0.86 percent reported mortality, but clearly not in the range reported earlier. The patient with left main disease, therefore, should be approached carefully, but can be evaluated safely in most instances.

The site and number of vascular accesses remain important. The use of the brachial artery substantially increased morbidity and mortality in recent series, whereas use of the femoral or axillary artery has been implicated by others. In the CASS report, morbidity was significantly greater with the brachial approach in institutions where both approaches were used, but in institutions performing greater than 80 percent Sones’ procedures the morbidity was quite low. In light of this, it is interesting that Judkins, in 1974, recommended that the practitioner become adept at “either, but not both, methods of angiography” for this very reason. The use of simultaneous femoral arterial and venous catheters has been implicated in the etiology of arteriovenous fistulae, which occur in 0.01 to 0.02 percent of patients.

An inverse relationship between complication rates and numbers of procedures performed annually, particularly in teaching hospitals, has been reported. This relationship was not supported in the CASS study, but appears to be important in certain specialized procedures such as angioplasty and transseptal catheterization. Changing practice patterns and hence decreased utilization, may increase the morbidity of the latter procedure. In light of the marked discrepancies in complication rates in different institutions, it has been recommended that laboratories with a mortality of greater than 0.1 percent give careful scrutiny to their methods of study and those with a greater than 0.3 percent mortality should terminate coronary angiography altogether.

Reactions to contrast material of some type are seen in 50 percent of patients, ranging from flushing and mild nausea to severe anaphylactoid reactions and death which occur in 1/40,000. There are no controlled studies, but pretreatment with steroids and antihistamines is advocated for prophylaxis in patients with previous allergic reactions. Contrast related nephropathy is another now well-recognized complication, occurring in up to 33 percent of high-risk patients, particularly diabetics. Avoidance of dehydration or infusion of mannitol may prevent its occurrence in