Multiple factors influence the incidence and types of complications, both fatal and nonfatal, after pulmonary resection. These include the age and physical status of the patient (i.e., cardiorespiratory functional status, type and extent of the procedure, nature of the pathologic process, and use of various therapeutic modalities).

The postoperative care of thoracic surgical patient is very important. All thoracic surgical patients require careful attention to ventilatory function. Despite advances in anesthesia, surgical technique, epidural catheters, pulmonary preservation techniques and postoperative care, the morbidity and mortality of pulmonary resection remain significant. The morbidity and mortality rates of pulmonary and esophageal resections, two to four times higher than elective coronary artery bypass surgery as written by Ginsberg and by Deslauriers. The overall postoperative mortality ranges between 6.2% - 24% after pneumonectomy, and 2.2% - 4.6% after lobectomy. Many reports showing major or minor complications in 30 to 40% of cases, as described by Olsen and Wahl and their associates. The clinical challenge of postoperative care is increasing with the development of new technologies and the increasing numbers of operations performed in the elderly, in patients previously treated radiation and chemotherapy, and in immunocompromised patients. Outcome must not only be optimal as judged by traditional clinical end points, but good results must be achieved with shorter lengths of stay and lower expenditure.

Major improvements in patient selection and appropriate preoperative preparation, as well as current operative and anesthetic techniques and more effective control of postoperative pain; have reduced the rates of postoperative morbidity and mortality. Although preoperative and intraoperative management best prevents postoperative morbidity, some complications are unavoidable. General postoperative principles include preoperative preparatory techniques such as smoking cessation, incentive spirometry teaching, pulmonary rehabilitation, and nutritional supplementation. Intraoperative and postoperative considerations include meticulous hemostasis and surgical technique; minimal intravenous fluids during and after pulmonary resection; adequate pain control; appropriate cardiac and oxygen saturation monitoring; chest physiotherapy; nasotracheal suctioning, minitracheostomy, or both; bronchodilators; and early and frequent ambulation. Even with optimal management in thoracic surgery, postoperative complications can occur.

The reports of Cerfolio (1996), Ferguson (1995), Kearney (1994), Lewis (1994) and their associates emphasize exacting preoperative functional evaluation to reduce the incidence of complications. The predictive values of various studies to determine postoperative values of forced vital capacity, forced expiratory volume in 1 second (FEV1), diffusing capacity of the lung for carbon monoxide (DLCO), and maximum oxygen consumption (VO2max) in poor risk patients are less than exact in relation to the occurrence of non fatal complications but somewhat more reliable regarding mortality. Ferguson and associates believe that the determination of DLCO is the most valuable single study, whereas Bolliger and colleagues (1995) believe that exercise testing with determination of VO2max expressed as a percentage of the predictive value is the single best predictor of postoperative complications. Rather than relying on a single study to predict the possibility of a postoperative complication or death, Pierce and colleagues (1994) and Melendez and Barrera (1998) have reported the usefulness of composite indices of the various lung function studies and other factors to predict the patient’s outcome.

Mortality rates after pulmonary resections, to be meaningful, must include all deaths occurring within 30 days of operation and all in-hospital deaths, regardless of the length of stay. After pneumonectomy, the mortality rates vary from as low as 1.5% to as high as 30%. The majority of deaths occur after a right pneumonectomy. In patients with carcinoma of the lung, the rates vary but are in the range of 5 to 15%. In a review of 586 pneumonectomies for resection of lung cancer in 1 year in Japan, the incidence of postoperative mortality was reported by Wada and associates (1998) to be only 3.2%. It must be noted, however, that this study is limited by reporting only...
30-days mortality, without mention of in-hospital deaths occurring after 30 days. The major causes of death after a pneumonectomy are respiratory insufficiency; septic complications, such as postoperative pneumonia or an empyema; the acute respiratory distress syndrome (ARDS)/acute lung injury (ALI); myocardial infarction; and pulmonary embolus. The mortality rates are lower after lobectomy than after pneumonectomy. Patient selection and disease process are the major factors influencing the occurrence of postoperative death. In review by Wada and colleagues (1998), the postoperative mortality rate was 1.2% after 5609 lobectomies carried out for resection of a lung cancer, but only 30-day mortality was included. The major causes of death after lobectomy are septic complications and cardiopulmonary insufficiency. Segmentectomy is essentially a benign procedure, and mortality rates of approximately 1% are reported when the procedure is done electively in patients with satisfactory pulmonary function. Wada and colleagues reported a 30-day mortality rate of 0.8% for lesser resection in 904 patients with lung cancer.

The acute respiratory distress syndrome (ARDS) is characterized by nonhydrostatic pulmonary edema and hypoxemia associated with a variety of etiologies causing both direct and indirect insults to the lungs. The process develops acutely (usually within 72 hours of the precipitating event), requires immediate recognition, and often leads to death despite maximal medical support. Therapeutic goals in the setting of ARDS are to provide appropriate resuscitation measures and to quickly identify the underlying precipitating event and address or eliminate it, if possible. Adequate tissue perfusion and oxygenation must be maintained to support vital organs. There has been a lack of uniformity of the definition of ARDS. The American Thoracic Society and the European Society of Intensive Care Medicine held a serious of meetings in 1992, from which the American-European Consensus Committee on ARDS was formed. The ARDS is on a continuum with ALI, which is less severe form of impairment. ALI is defined as a syndrome of inflammation and increased pulmonary capillary permeability that is associated with a constellation of clinical, radiologic, and physiologic abnormalities that cannot be explained by, but may coexist with, left atrial or pulmonary capillary hypertension. It is associated with numerous conditions most often sepsis syndrome, aspiration, primary pneumonia, or multiple trauma. The technical difference between ALI and ARDS is the degree of hypoxemia. ALI is present when the PaO2 divided by the fraction of inspired oxygen (FIO2) is 300 mmHg or less, regardless of the level of positive end expiratory pressure (PEEP), whereas ARDS is present when the PaO2 divided by FIO2 is 200 mmHg or less, regardless of the level PEEP.

The incidence of respiratory insufficiency after pulmonary resection continues to decrease, despite operating on higher risk patients. Before surgery, all patients should undergo full pulmonary function testing, with special emphasis on the level of the FEV1, DLCO, maximum voluntary ventilation, and an arterial blood gas obtained while breathing ambient air. The postoperative predicted FEV1 and DLCO should be calculated. These values can be determined by multiplying the preoperative value by expected amount of lung that should remain after the planned pulmonary resection.

Despite careful assessment of preoperative function and the use of pulmonary preserving techniques when indicated, pulmonary insufficiency can still occur after pulmonary resection. The inability to extubate a patient immediately after the operation is a poor prognostic sign, especially in the absence of an obvious anesthetic or surgical cause for this uncommon event, because the underlying problem may be inadequate remaining pulmonary function.

Signs of respiratory distress often begin before the appearance of an infiltrate on chest film. Sputum cultures should be obtained, and broad-spectrum antibiotics should be started and tailored to the cultures and sensitivities reported later. All basic aspects of pulmonary support should be done, including chest physiotherapy, bronchodilators therapy, limitation of intravenous fluids uptake, and nutritional support. Tracheostomy can be performed to allow direct suctioning. If respiratory insufficiency and radiographic infiltration persist, and results of cultures are not helpful, bronchoscopy should be performed for bronchoalveolar lavage.

Pulmonary complications are mainly responsible for mortality of patients undergoing thoracotomy; surgeons and anesthesiologists must actively participate in the development of more effective preventing strategies.

REFERENCES

2. Kutlu AC, Williams EA et al. A cute lung injury


