

Chapter 29

Critical Care of the Thoracic Surgical Patient

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ABSTRACT

Patients having major general thoracic surgery constitute an integral part of any cardiothoracic intensive care unit. Pulmonary or esophageal resection especially in a patient who has cardiopulmonary issues at baseline demands close monitoring by a critical care team postoperatively. This chapter aims to cover the important aspects of the perioperative care involved with these patients. In addition, procedures requiring an intensive care unit postoperatively such as, pneumonectomy, esophagectomy, thymectomy are dealt with in some detail where key technical aspects and care and complications specific to each are discussed.

INTRODUCTION

Thoracic surgical patients are potentially high risk patients given the nature of the surgery, anesthesia and the prevalent co-morbidities such as long smoking history and the intrinsic lung pathology. The goal of pre-operative evaluation is careful patient selection and pre-operative optimization. Post-operative care should be directed at prevention of complications and early recognition and management of complications when they do occur. This chapter will address the important aspects in perioperative evaluation and care of general thoracic patients with emphasis on post-operative management of those procedures that routinely demand critical care management.

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PRE-OPERATIVE ASSESSMENT

Pulmonary Function Testing/Assessment

Functional Residual Capacity and Closing Volume: Functional Residual Capacity (FRC) is the lung volume at the end of normal expiration and is the most important lung volume measurement that affects development of pulmonary complications. The closing volume (CV) is the volume of lung at which airflow from dependent parts of the lung stops during expiration owing to airway closure. Decreased FRC (from factors that increase intra-abdominal pressure) or increased CV (from advancing age, fluid overload, bronchospasm, etc.) will result in premature airway closure and atelectasis (Alexander, Hamilton, Parikh, Spence, & Stewart, 1972).

Spirometry: Forced Expiratory Volume in 1 second (FEV1) is one of the best predictors of risk for major lung surgery. An FEV1 < 2 liters is indicative of increased risk and the guidelines recommend additional physiological studies. A post-operative predicted FEV1 of 800ml to 1 liter is considered by many surgeons to be a precluding factor for lung resection. Spirometric values are more valuable when expressed as a percentage of predicted normal value based on age, sex and body height. Several authors have suggested a post-operative predicted value for FEV1 of 40% of normal as a cut off for selecting high risk patients (Pate, Tenholder, Griffin, Eastridge, & Weiman, 1996; Schuurmans, Diacon, & Bolliger, 2002).

Quantitative perfusion scan: The functional contribution of the different segments of the lung can be measured by split perfusion scanning using technetium or by quantitative CT scanning.

DL_{co}: Diffusing Capacity of the Lung is a measurement of the gas exchange function of the lung at the alveolar-capillary interface. It provides a measure of lung parenchymal disease. A preoperative DL_{co} of < 45% of the predicted value is associated with a higher mortality and pulmonary morbidity rate in patients undergoing pulmonary resection (Win et al., 2005).

Exercise testing: Preoperative exercise testing include tests such as the shuttle walk, the 6 minute walk, exercise oximetry, and oxygen consumption during maximum exercise (VO_{2 max}). Exercise testing is the best determinant of functional capacity. By generally agreed standards, a VO_{2 max} < 10ml/kg/minute puts a patient in an extremely high risk category for major lung resection and a VO_{2 max} > 15ml/kg/minute is indicative of an average risk patient (Benzo, Kelley, Recchi, Hofman, & Sciurba, 2007; Bolliger et al., 1995).

The evaluation algorithm proposed by the ACCP consensus guidelines is presented below in Figure 1 (Colice, Shafazand, Griffin, 2007).

Age and performance status: Both advancing age and performance status have been shown to be independent predictors of increased post-operative mortality (Dales, Dionne, Leech, Lunau, & Schweitzer, 1993; Kohman, Meyer, Ikins, & Oates, 1986; Harpole et al., 1999). The decision to operate or not should not be based on age alone and the functional status of the patient should be taken into consideration.

Cardiac Evaluation

All patients undergoing major pulmonary resection should have at a minimum, a pre-operative electrocardiogram. Any abnormalities should prompt an echocardiogram. As per the American Heart Association, non-cardiac surgery is acceptable 6 weeks after a myocardial infarction. Patients with major risk predictors should be considered for revascularization or valve surgery prior to pulmonary resection. Some

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