Surgical Approach to Pulmonary Nontuberculous Mycobacterial Infections

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KEYWORDS

• Bronchiectasis • Thoracoscopic lobectomy • VATS lobectomy • Thoracoscopic segmentectomy • VATS segmentectomy • Pneumonectomy • Lobectomy • Nontuberculous mycobacteria

KEY POINTS

- Failure of medical therapy and symptom relief are the two main indications for surgical resection in pulmonary NTM disease.
- Most indicated resections may be performed through a minimally invasive (VATS) approach.
- In general, these resections are associated with low morbidity and mortality, although more extensive resections carry higher risk.
- Although outcomes in observational studies seem promising, much more data are needed to confirm the benefits of resection in this population.

INTRODUCTION

Although the true numbers are unknown, it is generally accepted that the incidence of pulmonary nontuberculous mycobacterial (NTM) disease is increasing in North America. Although targeted antimicrobial therapy remains the mainstay of therapy in these patients, failure of medical therapy is not uncommon. The addition of adjunctive surgical resection has been suggested to improve treatment success rates in those with focal parenchymal damage, such as bronchiectasis or cavitary lung disease. The rationale for adding surgery to the treatment of affected patients is that these areas of parenchymal disease are poorly penetrated by the antibiotic therapy, and thus serve as a "reservoir" for organisms to trigger recurrent infection. In this article, the common indications, techniques, and outcomes of pulmonary NTM surgery are discussed.

INDICATIONS FOR SURGERY

All patients must meet the criteria for pulmonary NTM infection described in the recent American Thoracic Society guidelines,[1] have focal parenchymal disease amenable to resection, and possess adequate pulmonary reserve in light of the planned surgical procedure.

Three main indications for surgery exist. In most cases, resectional surgery is performed after failure of medical therapy, as a means to induce treatment success. In these cases, the parenchymal disease should be truly "focal" in nature, whereby following resection the remaining lung is relatively free of structural damage. The presence of macrolide or other significant drug resistance is an additional impetus for the consideration of surgery in this setting, because eradication of the infection with standard medical regimens becomes less likely. Although patients often view the addition

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of surgery in this setting as the curative element of their therapy, it must be emphasized that the medical treatment remains the central component of their care.

The second indication for surgery in patients with NTM disease is symptom relief. Typically, these symptoms are not life-threatening (eg, intractable cough), but are bothersome and interfere with the activities of everyday life. For a few, the symptoms may relate to a potentially lethal process (eg, significant hemoptysis) that requires surgical resection to resolve permanently. It is not uncommon for patients to suffer failure of medical therapy and intractable symptoms, for which resection may be quite helpful. In cases where symptom control is the primary objective, it is understood and accepted that areas of parenchymal damage may remain following resection, although it is critical that clinicians identify and target the relevant areas producing the symptoms.

The third indication for surgery, used selectively, is to limit or slow down the progression of disease. The goal in this situation is not to eradicate the infection, but to stabilize the clinical situation and perhaps improve the effectiveness of the medical therapy. In these cases, a "debulking" of the worst areas of parenchymal damage is performed, which if left alone may accelerate or contribute to disease in previously healthy areas. An example of this approach is the patient with bilateral parenchymal disease, but with one side much more involved, largely destroyed with cavitary disease related to the NTM infection. Resection of the destroyed lung may limit the spillage (soilage) of infected secretions to the better remaining lung, and thus slow the progression of disease.

PREOPERATIVE EVALUATION

The consideration of surgery for patients with bronchiectasis and/or cavitary lung disease related to NTM infection should be discussed in a multidisciplinary setting. Only a small proportion of all patients with pulmonary NTM disease will likely benefit from the addition of surgery to their treatment regimen. At our institution, a multidisciplinary conference is held weekly and is attended by surgeons, pulmonologists, and infectious disease clinicians with specialization in respiratory infectious disease. Case histories are individually discussed, with treatment alternatives and the optimal surgical approach explored. Using this method, we believe the benefits for our patient population are maximized.

Preoperative evaluation involves an extensive assessment including radiologic and physiologic testing and sputum analysis to optimize medical therapy. High-resolution computed tomography of the chest is performed to assess the extent of the parenchymal lung disease (Fig. 1). Adequate pulmonary reserve is ensured through the use of pulmonary function testing, with occasional use of perfusion scanning and exercise testing when appropriate. Cardiac evaluation may involve echocardiography to evaluate possible valvular pathology and the presence (if any) of pulmonary hypertension, and selective use of stress testing to assess coronary disease.

Bronchoscopy is performed when appropriate, primarily for diagnostic purposes and to rule out concomitant endobronchial pathology. In the setting of active hemoptysis, bronchoscopy is used to localize the source within the bronchial tree to the segmental or even subsegmental level. Collection of sputum and bronchoalveolar lavage specimens allows identification of the likely microbial pathogens. Confirmation of the presence of NTM disease was made in accordance with the guidelines published by the American Thoracic Society.[1] Evaluation of culture results includes in vitro susceptibility testing appropriate for the cultured organism.

A complete nutritional assessment is made at the time of initial presentation, and dietary supplementation is initiated when indicated. Routine use of feeding tubes is discouraged, and is likely unnecessary in those with focal disease. In select patients with significant parenchymal (typically cavitary) disease and subsequent malnutrition, placement of a percutaneous gastrostomy tube may be helpful, although even with intensive supplementation substantial weight gain is unlikely. In addition, all patients were evaluated for the presence of significant gastroesophageal reflux.

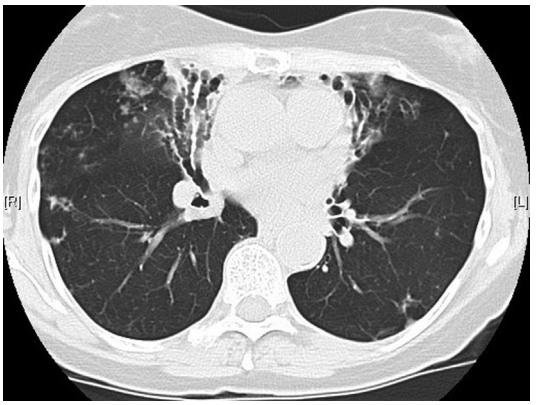

Fig. 1. Computed tomography image of a patient with NTM infection associated with right middle lobe and lingular disease, the so-called "Lady Windermere syndrome."