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Surgical management of bronchiectasis: analysis and short-term results in 238 patients

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Abstract

Objective: Bronchiectasis is defined permanent dilatations of bronchi with destruction of the bronchial wall. It is still a major cause of morbidity and mortality in developing countries. The aim of this retrospective study is to present our surgical experiences, the early and long-term results of 238 patients with bronchiectasis during a 10-year period. **Methods:** We reviewed the medical records of 238 patients who underwent surgical resection for bronchiectasis between January 1992 and December 2001, at Gülhane Military Medical Academy (GMMA) Thoracic Surgery Department. Variables of age, sex, symptoms, etiology, and type of operation, mortality, morbidity and the result of surgical therapy were analyzed. **Results:** There were 205 (86.13%) male and 33 (13.87%) female patients with an average age of 23.7 and a range of 15–48 years. The presenting symptoms were productive cough in 133 (55.88%), fetid sputum in 116 (48.73%), recurrent infections in 84 (35.29%), and hemoptysis in 39 (12.18%) patients. The disease was bilateral in 31 patients (13.02%) and mainly confined to the lower lobes in 162 (68.06%). The surgical treatment was as follows: pneumonectomy in 13 patients (5.46%), lobectomy in 189 (79.40%), lobectomy + segmentectomy in 31 (13.02%), and wedge resection or segmentectomy in five (2.1%). Staged bilateral thoracotomy was used in 14 patients. There was no operative mortality. Complications occurred in 21 patients and the morbidity rate was 8.82%. Complete resection was achieved in 154 (64.7%) patients. Follow-up data were obtained for 229 (96.21%) of the patients. Nine patients were lost to follow-up. The mean follow-up of these patients was 9 months (range, 3 months to 4 years). The symptoms disappeared in 189 patients (79.41%) and 29 patients (12.18%) had improved, whereas 11 patients (4.62%) had no improvement. Significantly better results were obtained in patients who had undergone a complete resection. **Conclusions:** Surgical resection for bronchiectasis can be performed with acceptable morbidity and mortality at any age. The involved bronchiectatic sites should be resected completely for the optimum control of symptoms.

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Keywords: Surgical management; Bronchiectasis

1. Introduction

Bronchiectasis is defined permanent dilatations of bronchi with destruction of the bronchial wall. Bronchiectasis was first described by Laenec in 1819 and, before the antibiotic era, was considered a morbid disease with a high mortality rate from respiratory failure and cor pulmonale.

After the advent of antibiotics the effective treatment of pulmonary infections in childhood, as well as the incidence and surgical importance of bronchiectasis has decreased in industrialized countries over the last half century. However, it is still a major cause of morbidity and mortality in

developing countries [1]. The clinical features of the disease may vary widely from a sputum expectoration to a massive hemoptysis.

Current reports about the surgical management for bronchiectasis show that limited localized disease was associated with good postoperative prognosis [2–6].

The aim of this retrospective study is to present our surgical experiences, the early and long-term results of 238 patients with bronchiectasis during a 10-year period.

2. Material and methods

We reviewed the medical records of 238 patients who underwent surgical resection for bronchiectasis between

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January 1992 and December 2001, at Gülhane Military Medical Academy (GMMA) Thoracic Surgery Department. Variables of age, sex, symptoms, type of bronchiectasis, type of operation, mortality, morbidity and the result of surgical therapy were analyzed for 238 patients.

Patients were admitted to the department from either the Chest Disease Department or our outpatient clinic. All patients were examined after a detailed history and blood tests were studied. Chest radiography, computed tomography of the chest (HRCT) (Fig. 1) and pulmonary function tests were carried out. Two weeks before the surgery, chest physiotherapy was initiated at the outpatient department. Preoperative and postoperative bronchoscopic toilet of the tracheobronchial tree was applied. The bronchial aspirate was sent for microbiologic culture analysis. Fiberoptic bronchoscopy (FOB) was also performed for all patients to determine the endo-bronchial pathology. Prophylactic antibiotics given for 48 h prior to surgery prepared all patients undergoing surgery. Patients were chosen as candidates for surgical treatment using the following criteria: localized bronchiectasis which is documented by HRCT; adequate cardiopulmonary reserve; symptoms such as chronic productive cough, repeated or significant hemoptysis, and recurrent pulmonary infections; failure of medical treatment.

A double-lumen endotracheal tube was used for all patients to avoid a possible intraoperative contamination of contralateral lobes. Pulmonary resection was performed via a posterolateral thoracotomy. The resection type was selected according to the affected sides and cardiopulmonary reserve.

Complete resection is defined as an anatomic resection of all affected segments. The bronchial stump was stapled by using a mechanical stapler. Usually we do not use a flap (mediastinal pleura or tissue) for covering the bronchial

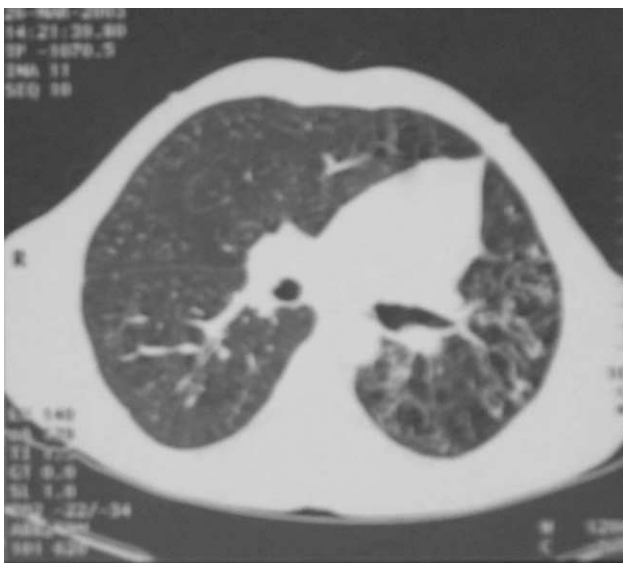


Fig. 1. HRCT scan showing bronchiectasis.

Table 1
Symptoms of the patients

Symptoms	No. of patients (%)
Productive cough	133 (55.88%)
Fetid sputum	116 (48.73%)
Recurrent infections	84 (35.29%)
Hemoptysis	39 (12.18%)
No symptoms	10 (4.20%)

stump. Chest physiotherapy was reinitiated and continued for 2 weeks after discharge. All patients had specific or wide-spectrum antibiotic therapy for 1 week.

Follow-up information was obtained by periodic outpatient visits for all patients except nine. We were unable to contact these patients to invite them for their control examination.

3. Results

There were 205 (86.13%) male and 33 (13.87%) female patients with an average age of 23.7 and a range of 15–48 years (our patients are mainly young males who are on military service).

The presenting symptoms were productive cough in 133 (55.88%) patients, fetid sputum in 116 (48.73%), recurrent infections in 84 (35.29%), and hemoptysis in 39 (16.38%). Ten patients (4.2%) presented without any symptoms (Table 1). The mean duration of symptoms was 2.4 years (range, 1–18 years). One hundred and sixty-three of 238 patients (68.4%) had previous medical therapy before admission to our department.

The possible etiology of bronchiectasis is pneumonia in 86 (36.13%) patients, childhood infection in 63 (26.47%), pulmonary sequestration in four (1.68%) and obstruction due to foreign body in one (0.42%). There were 84 (35.29%) patients with unknown etiology (Table 2).

The disease was bilateral in 31 patients (13.02%) and mainly confined to the lower lobes in 162 (68.06%). The mean number of segments involved was 4.2 (range, 1–11). Four or less segments had been involved in 149 (62.60%) of the patients.

The most frequent microorganisms were *Pseudomonas aeruginosa* in 21 (8.82%), *Hemophilus influenzae* in 16

Table 2
Etiologic factors of bronchiectasis

Etiologic factor	No. of patients (%)
Pneumonia	86 (36.13%)
Childhood infection	63 (26.47%)
Pulmonary sequestration	4 (1.68%)
Obstruction due to foreign body	1 (0.42%)
Unknown etiology	84 (35.29%)

Table 3
Microbiologic culture results of the patients

Microorganism	No. of patients (%)
<i>Pseudomonas aeruginosa</i>	21 (8.82%)
<i>Haemophilus influenzae</i>	16 (6.72 3%)
<i>Klebsiella pneumoniae</i>	9 (3.78%)
<i>Staphylococcus aureus</i>	8 (3.36%)
Other Gram-positive coccus	12 (5.04%)
Tuberculosis	7 (2.94%)

(6.72%), *Klebsiella pneumoniae* in nine (3.78%), *Staphylococcus aureus* in eight (3.36%), and *Mycobacterium tuberculosis* in seven (2.94%) (Table 3).

The surgical treatment was as follows: pneumonectomy in 13 patients (5.46%), lobectomy in 189 (79.40%), lobectomy + segmentectomy in 31 (13.02%), and wedge resection or segmentectomy in five (2.1%). Staged bilateral thoracotomy was used in 14 patients (Table 4).

There was no operative mortality. The mean duration of hospital stay was 9.4 days (range, 5–24 days). Complications occurred in 21 patients and the morbidity rate was 8.82%. The complications were: sputum retention and atelectasis which needed bronchoscopic aspiration in seven patients (2.94%), persistent air leak more than 10 days in six (2.52%), empyema in two (0.84%), bronchopleural fistula in two (0.84%), and postoperative hemorrhage that needed re-thoracotomy in four (1.68%) (Table 5).

Complete resection was achieved in 154 (64.7%) patients. Follow-up data were obtained for 229 (96.21%) of the patients. The mean follow-up of these patients was 9 months (range, 3 months to 4 years). The symptoms disappeared in 189 patients (79.41%), and 29 patients (12.18%) showed improvement whereas 11 patients (4.62%) had no improvement (Table 6).

4. Discussion

Bronchiectasis is pathologically defined as a condition in which there are abnormal and permanent dilatations of proximal bronchi. Before the antibiotic era the disease was considered a morbid one with a high mortality rate from

Table 4
Type of operation

Operation type	No. of patients (%)
Pneumonectomy	13 (5.46%)
Lobectomy	189 (79.40%)
Lobectomy + segmentectomy	31 (13.02%)
Segmentectomy	5 (2.1%)
Inferior segment of lingula	1 (0.42%)
Lateral segment of middle lobe	3 (1.26%)
Medial segment of middle lobe	1 (0.42%)

Table 5
Complications of operation

Complication	No. of patients (%)
Sputum retention and atelectasis	7 (2.94%)
Persistent air leak more than 10 days	6 (2.52%)
Empyema	2 (0.84%)
Bronchopleural fistula	2 (0.84%)
Postoperative hemorrhage	4 (1.68%)

respiratory failure and cor pulmonale. Due to adequate treatment of pulmonary infections by specific antibiotics in childhood, the incidence and surgical importance of bronchiectasis has decreased over the last half-century in developed countries, but it still remains a surgical problem in developing countries [3]. Recurrent pulmonary infections either in childhood or adulthood were the leading cause of bronchiectasis in our patient population. Other large series have also emphasized the etiologic importance of pulmonary infections in childhood [2,3,7]. Bronchial obstruction by foreign bodies is also another important etiologic factor in children.

Patients with bronchiectasis typically present with recurrent pulmonary infections, productive cough, bronchial suppuration and purulent bronchorrhea [1]. This fetid sputum is also a psychological indication for surgery. Similar to our series, cough, purulent and fetid sputum, and hemoptysis are the most common symptoms in other series [2,6,7].

Although plain chest radiographs are usually the first line of examination, the diagnostic importance is fairly limited. Before the advent of HRCT, the bronchogram was the most important procedure for diagnosis [1,2]. HRCT scan is currently the best technique to establish the presence, severity and distribution of disease, by a sensitivity of 66% and specificity of 92% with 10-mm sections [8,9]. The preoperative diagnosis was based on HRCT scan findings in all our cases.

Pulmonary function studies were performed for all patients in our series and found to be normal in patients with localized bronchiectasis. In patients with severe bronchiectasis a mixed obstructive and restrictive pattern with hypoxemia has been observed [1].

Preoperative bronchoscopy should be routinely done to rule out benign or malignant cause of obstruction [5].

In general, bronchiectasis affects most dependent portions of the lung, which includes posterior basal portions

Table 6
Follow-up symptoms of the patients

	No. of patients (%)
Symptoms disappeared	189 (79.41%)
Symptoms improved	29 (12.18%)
Symptoms had no improvement	11 (4.62%)

of the lower lobes, middle lobe and lingula. Overall one third of bronchiectasis is unilateral and affects a single lobe, one third is unilateral but affects more than one lobe, and one third is bilateral [1]. The disease was mainly confined to the lower lobes in 124 (68.8%) of our patients.

The initial treatment strategy for all patients with this disease should be conservative. Infection control, bronchodilatation and chest physiotherapy (postural drainage) are the main components of conservative treatment.

Hodder et al. stated the criteria for patients who are candidates for surgical resection. Those criteria are generally accepted today and are given in Section 2 [10]. The goals of surgical treatment are complete resection of affected segments while preserving maximum function, therefore every type of resection is possible for this purpose. Ultimately, a minimum of two lobes or six pulmonary segments must be spared to ensure adequate pulmonary function. Dense adhesions sometimes cause technical difficulties during operation. One has to be very careful in mobilizing the adhesions over the diaphragmatic surface because occasionally the bronchiectasis will be due an undiagnosed intralobar sequestration, and the aberrant systemic artery may be injured during the maneuvers [1,11,12].

Most of our patients had limited disease and complete resection was achieved in 154 patients (64.7%). Complete resection was achieved in 83% and 87.8% of patients in series carried out by Fujimoto et al. [2] and Kutlay et al. [5]. However, bilateral bronchiectasis does not present a contraindication to surgery in selected patients; the results of surgery in patients with diffuse and multi-segmental disease are less predictable and medical treatment should be preferred [11].

Complication occurrence is 9.4–24.6% in the current literature, therefore our result of 8.8% is rather better [5,13–15]. Since ours is a continuous series, some of the patients will be seen in the next few years and we will have the opportunity to evaluate morbidity over the long-term follow-up period.

Complete resection of the diseased parenchyma is the most important significant prognostic factor; the others are type of bronchiectasis and absence of sinusitis [5,13]. Significantly better results were obtained in patients who had undergone a complete resection in our series.

In conclusion, surgical resection for bronchiectasis can be performed with acceptable morbidity and mortality at any age. The involved bronchiectatic sites should be resected completely for the optimum control of symptoms.

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