

Surgical Treatment of Bronchiectasis: A Retrospective Long-Term Analysis of 55 Patients

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Abstract

Introduction: The prevalence of bronchiectasis has significantly decreased over recent decades. While nowadays patients with early disease can be successfully treated by conservative therapies, surgical treatment still plays a significant role in developing countries or areas with limited access to healthcare.

Objectives: The aim of this retrospective study is to present our surgical experiences and both short and long term results of 55 patients with bronchiectasis during a 20-year period.

Methods: We retrospectively reviewed a prospectively collected database of 55 patients with bronchiectasis who underwent pulmonary resection in two large urban tertiary referral centres in Buenos Aires city from 1995 to 2015. All patients were assessed through a detailed history, physical examination, blood tests, computed tomography (CT) scan, bronchoscopy and pulmonary function tests. Data of these 55 patients were analysed for age, gender, symptoms, type of resection, operative morbidity and mortality, and functional results. Sputum culture and sensitivity tests of all patients were examined. Nonsurgical treatments included antibiotic therapy, postural drainage with vibratory massage, and bronchodilator and corticosteroid treatments.

Results: Follow-up data were obtained for 51 (92.3%) patients. The symptoms disappeared in 43 patients (78.1%), 10 patients (18.1%) showed improvement and 2 patients (3.6%) showed no symptom improvement. All patients with complete resections had long-term resolution of symptoms.

Conclusion: Surgical treatment of pulmonary bronchiectasis may be performed with a low rate of complications and very low mortality and morbidity rates, improving symptoms.

Keywords: Bronchiectasis; Computed Tomography (CT); Bronchoscopy

Background

The prevalence of bronchiectasis has significantly decreased over recent decades. Though, in the era of antibiotic therapy, patients with early disease can be successfully treated by conservative therapies, surgical treatment still plays a significant role in developing countries or areas with limited access to healthcare [1].

Surgical treatment has been applied since the late 1930s in order to improve the quality of life (QOL) of patients with non-cystic fibrosis bronchiectasis, as it alleviates symptoms or shortens the duration of conservative treatment [2,3]. However, the complexity of

the surgical procedure, a potential high rate of postoperative complications and the residual limitation of pulmonary function are major concerns at the time of performing a resection for a benign condition.

Aim of the Study

The aim of this retrospective study is to present our surgical experiences and both short and long term results of 55 patients with bronchiectasis during a 20-year period.

Material and Methods

We retrospectively reviewed a prospectively collected database of 55 patients with bronchiectasis who underwent pulmonary resection in two large urban tertiary referral centres in Buenos Aires city from 1995 to 2015. All patients were assessed through a detailed history, physical examination and blood tests that included a complete blood count and serum chemistries. Diagnosis of bronchiectasis was confirmed by computed tomography (CT) scan in every case. Pulmonary function tests were routinely performed. Data of these 55 patients were analysed for age, gender, symptoms, type of resection, operative morbidity and mortality, and functional results. In most patients, bronchoscopy was performed during diagnosis, just after the induction of anaesthesia and at the end of surgery to aspirate secretions to prevent atelectasis. Bronchial secretion samples were sent for microbiological culturing. Chest physiotherapy was performed and prophylactic antibiotics were administered for 48 hours prior to surgery. Sputum culture and sensitivity tests of all patients were examined.

The patient selection criteria for surgery included localized bronchiectasis diagnosed by high-resolution CT, symptoms such as chronic productive cough, repeated or significant haemoptysis, lung abscess, empyema, recurrent pulmonary infection, and failure of nonsurgical treatment. Nonsurgical treatments included antibiotic therapy, postural drainage with vibratory massage, and bronchodilator and corticosteroid treatments. Failure of nonsurgical treatment was defined as frequent exacerbations that interfered with normal professional or social life or required multiple hospitalizations. Patients referred for surgery presented localized disease, good cardiopulmonary function, severe recurrent symptoms which impacted QOL or life-threatening complications (e.g. haemoptysis).

Surgeries were performed under general anaesthesia with the use of a double-lumen endobronchial tube to prevent spillage of secretions to the opposite side of the lung. During anaesthesia, a peridural catheter was placed (between T5-7) for regional analgesia, which was used for the next two or three post-operative days. In patients with empyema or pulmonary abscess it was not indicated because of the risk of contamination of the peridural space during placement. Toilet-bronchoscopy is routinely performed after intubation with the patient on a lateral decubitus position. Surgical approach depended on the location of the lobe or pulmonary segment to be resected. The most used was axillary thoracotomy.

Complete resection was defined as anatomic resection of affected segments according to preoperative CT and if after surgery the patient was considered free of bronchiectasis. During pulmonary resection, excessive bronchial dissection was avoided, and peribronchial tissues were preserved. A mediastinal pleura flap was used in cases where the bronchial duct rupture (bronchial fistula) was suspected or when a significant residual cavity.

Postoperative management included antibiotic and analgesic therapy as well as chest physiotherapy. Operative mortality was considered when patients died within 30 days after thoracotomy or later during the same hospitalization period.

Statistical analysis

All data were analysed by using SPSS 15 for Windows. Quantitative and qualitative variables were compared by t-test and chi-square test respectively. A value of $P \leq 0.05$ was considered statistically significant.

Results

The mean age of the 55 patients at the time of thoracotomy was 55.6 years (range 19 - 78). There were 28 female and 27 male patients. Only five patients (9.1%) were younger than 30. All patients were symptomatic for a mean of 7.9 ± 6.9 years (range, 1 to 24 years).

Twenty-patients (36.6%) suffered symptoms for more than 5 years. In 14 patients, the consultation that finally resulted in surgery was due to an exacerbation (haemoptysis and/or infection). Predominant symptoms included recurrent cough, chronic sputum and recurrent bronchial infection. Thirty eight patients (69.1%) had received previous medical therapy in the year prior to admission to our department. The mean number of antibiotic courses administered to these 38 patients was $2,42 \pm 1,9$.

In 44 patients (80.0%), bronchiectasis were found on the left side and the most common location was the left lower lobe (n = 40, 72.7%). Bilateral bronchiectasis was found in 4 (7.2%) patients. Bronchiectasis was limited to only one lobe in 37 (67.2%) cases. Locations of bronchiectasis are shown in figure 1.

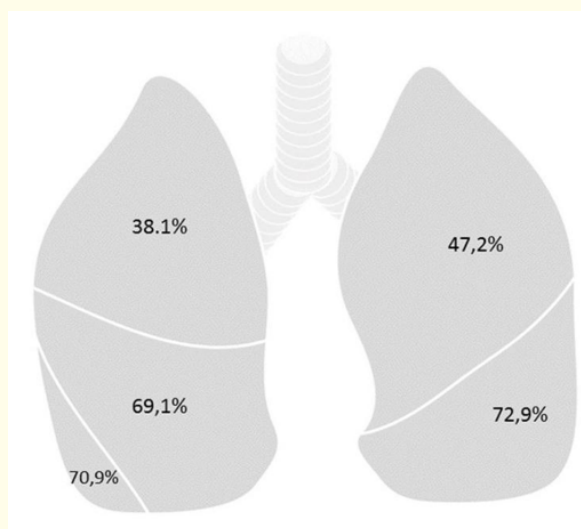


Figure 1: Bronchiectasis locations.

A positive culture of sputum was found at some time in 37 patients (67.7%). In 25 patients, (45.5%) the first culture was positive. In 46 patients, more than 3 sputum cultures were available, and 36.7% (n = 17) had at least 3 positive cultures. Among the 18 patients with at least 2 positive sputum cultures, 94.4% had the same microorganism. There were no cases of positive smears and cultures for tuberculosis. *Pseudomonas aeruginosa* was cultured in 8 patients (14.5%) and represented 32.2% of all organisms. *Haemophilus influenzae*, the second most common pathogen, was found in 3 patients (5.4%), followed by gram-positive cocci in 3 (4.1%). *Staphylococcus aureus* was present in 2 (3.6%), *Klebsiella pneumoniae* in 2 (3.6%), *Klebsiella blee* in 2 (3.6%), pneumococcus in 2 (3.6%) and *Serratia marcescens* in 1 patient (1.8%).

Forced vital capacity (FVC) and forced expiratory volume (FEV1) were $68.7 \pm 38.0\%$ (range 38 - 100%) and $55.0 \pm 35\%$ (range 39 - 96%) respectively. Only 6 patients were on permanent oxygen therapy. Nine patients suffered from gastroesophageal reflux (16.3%), 17 had a previous diagnosis of asthma (30.9%) and 7 (12.7%) reported abusive alcohol consumption. Demographic data is shown in table 1.

Indications for resection comprised: 1) failure of conservative therapy to control purulent sputum resulting in frequent exacerbations that interfered with normal professional or social life or required multiple hospitalizations in 44 (80.0%); 2) recurrent moderate haemoptysis or massive haemoptysis in 5 (5.5%); 3) emergency life-threatening haemoptysis in 2 (3.6%); and 4) lung abscess in 4 (7.2%). The most common type of resection was lobectomy in 26 (69.8%) cases. Other resection types are listed in table 2. Only 3 patients underwent pneumonectomy, as a result of a destroyed lung.

Age (mean)	55.6 (19-78)
Sex	
Male	27 (49.1%)
Female	28 (50.9%)
Time of symptoms in years (mean)	7.9 +/- 6.9
Symptoms	
Chronic cough	34 (61.6%)
Chronic sputum	26 (47.2%)
Fetid sputum	10 (18.1%)
Hemoptysis	13 (23.6%)
Massive hemoptysis	3 (5.4%)
Pneumonia	17 (30.9%)
Recurrent bronchial infection	22 (40%)
Patients that received medical treatment (n - %)	38 (69.1%)
Number of antibiotic courses	2.42 +/- 1.9
Site of bronchiectasis	
Right upper lobe	38,10%
Right middle lobe	69,10%
Right lower lobe	70,90%
Left upper lobe	47,20%
Left lower lobe	72,90%
Positive sputum culture at any time	37 (67.7%)
Germs	
<i>Pseudomonas aeruginosa</i>	8 (14.5%)
<i>Haemophilus influenzae</i>	3 (5.4%)
<i>Gram-positive cocci</i>	3 (4.1%)
<i>Staphylococcus aureus</i>	2 (3.6%)
<i>Klebsiella pneumoniae</i>	2 (3.6%)
<i>Klebsiella BLEE</i>	2 (3.6%)
<i>Streptococcus pneumoniae</i>	2 (3.6%)
<i>Serratia marcescens</i>	1 (1.8%)
FVC	68.7+/-38%
FEV1	55+/-35%
Patients on oxygen therapy	6 (10.1%)
Comorbidities	
Gastroesophageal reflux	9 (16.3%)
Previous diagnosis of asthma	17 (30.9%)
Abusive alcohol consumption	7 (12.7%)

Table 1: Demographics.

Operation type n n*	n	%
Pneumonectomy	3	5.4
Bilobectomy	2	3.6
Lobectomy	45	81.2
Segmentectomy or wedge resection	5	9.1
Total	55	100

Table 2: Surgical procedures.

Complete resection was achieved in 42 (76.4%) patients. Follow-up data were obtained for 51 (92.3%). Mean follow-up was 14 months (range, 6 months to 20 years). The symptoms disappeared in 43 patients (78.1%), 10 patients (18.1%) showed improvement and 2 patients (3.6%) showed no symptom improvement (Figure 2). All patients with complete resections had long-term resolution of symptoms. The results of pathological sections confirmed that all patients had non-active tuberculous purulent bronchiectasis. Among them, there were 33 (60.0%) cystic bronchiectasis, 40 (72.7%) cylindrical bronchiectasis and 31 (58.17%) mixed bronchiectasis (Figure 3).

Two patients underwent emergency surgery because of life-threatening haemoptysis. There was one case of operative mortality (empyema with bronchopleural fistula and respiratory failure). Mean hospital stay was 5.0 ± 3,8 days (range 3 - 5 days). Complications occurred in 6 patients and the morbidity rate was 11.3%. The complications were: atelectasis in 4 patients (7.2%) and empyema in 2 (3.6%). The two patients who developed post-operative empyema had positive sputum cultures at the time of surgery in spite of multiple antibiotic treatments. In a univariate model of logistic regression, neither an emergency procedure nor the history of a positive culture for *Pseudomonas* predicted mortality. The only identifiable risk factor was BMI < 20 (p = 0,003).

Discussion

The incidence of bronchiectasis has decreased as the treatment of children with pulmonary infections has improved. However, it is still a relevant health problem in the subgroup of patients with limited access to health care, even in developed countries [4].

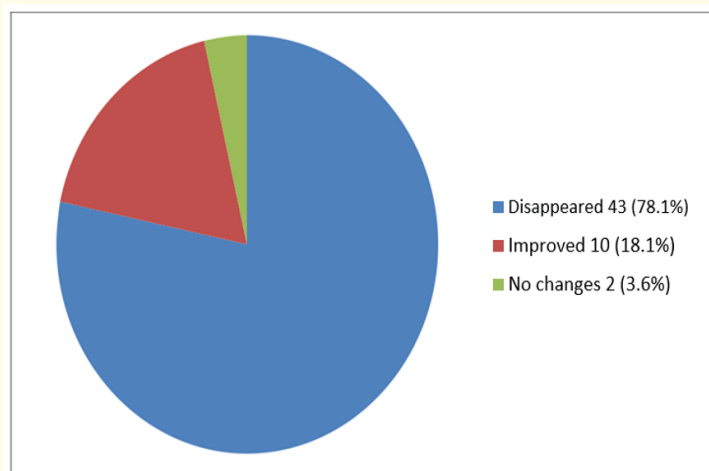


Figure 2: Symptom control after surgery.

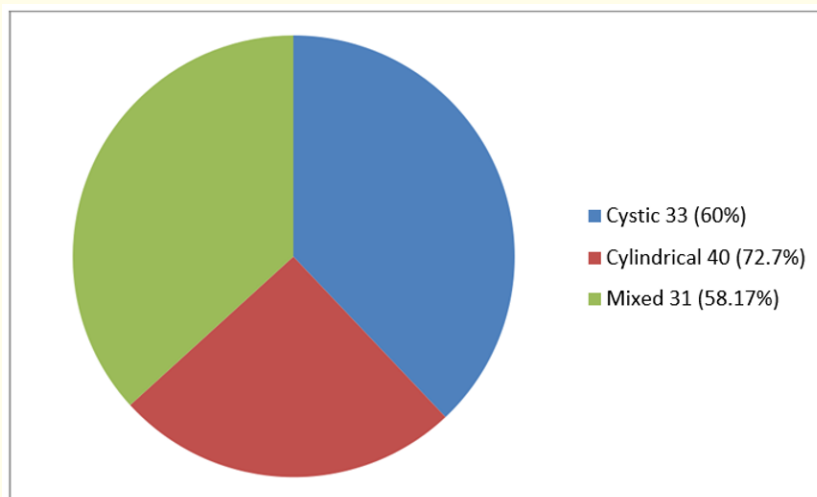


Figure 3: Type of bronchiectasis - Post operative diagnosis.

The most common etiology of bronchiectasis in our patients was lung infection during the early years of life (55.5%), as has been reported in other series [5,6]. Similarly, to other authors, we have found that sequela of tuberculosis is still a relevant cause of permanent damage [7,8].

Common symptoms of bronchiectasis, such as recurrent pulmonary infections, productive cough, haemoptysis, bronchial suppuration and purulent bronchorrhea, have been found in our patients, with a similar prevalence to reports in the literature [9-11]. Haemoptysis is rarely fatal but may require an emergency surgical procedure, as was the case in 3.6% of our patients who suffered from uncontrollable massive haemoptysis [12]. Higher figures of massive haemoptysis (9.6%) have been reported as reason for emergency surgery [13].

According to our data, the most prevalent pathogens have not changed since the early reports of *Pseudomonas aeruginosa* and *Haemophilus* [5,14]. The role of inhaled antibiotics in effectively removing the colonization of those germs may be important to decrease postoperative infectious complications in the future. *Pseudomonas* infections have been identified as risk factor for poor postoperative outcome.

Pneumonectomy (like in other series) has been limited to a reduced number of patients and in all cases the lung resected was destroyed and non-functional [15].

One patient died due to surgical complications (3.6%) from an empyema. He was debilitated from uncontrollable recurrent serious pulmonary infections. Our morbidity rate was 11%. Previous studies reported morbidity rates around between 11 and 24% [5-13,16,17]. The main risk factor for post-operative complications was a low BMI, which shows the importance of careful long-term preoperative preparation. A previous history of a positive culture of *Pseudomonas* was shown to be a risk factor for relapse of symptoms. However, there was no evidence in our patients that the risk of postoperative mortality or morbidity may be increased in those patients.

Several reports have stated that the incomplete resection of affected lungs is a prognostic factor for worse operative results and a higher relapse rate [18-22]. During a long follow-up, none of the patients with a complete resection and complete improvement of symptoms suffered from symptomatic recurrence.

Conclusion

In conclusion, surgical treatment of pulmonary bronchiectasis may be performed with a low rate of complications and very low mortality and morbidity rates. It improves symptoms, especially if all diseased lung segments are removed. For a favourable outcome, the efforts of the whole clinical-surgical team must be directed towards the complete resection of bronchiectasis while the disease is still localized and remains free from *P. aeruginosa* infection. Careful preoperative preparations are of utmost importance to reduce surgery-related morbidity and mortality. Close follow-up, continued treatment with specific antibiotics, and improved living conditions play important roles in reducing the recurrence rate of this disease.

Bibliography

1. Balci AE., *et al.* "Current surgical therapy for bronchiectasis: surgical results and predictive factors in 86 patients". *Annals of Thoracic Surgery* 97 (2014): 211-217.
2. Ashour M., *et al.* "Current surgical therapy for bronchiectasis". *World Journal of Surgery* 23.11 (1999): 1096-1104.
3. Vallilo CC., *et al.* "Lung resection improves the quality of life of patients with symptomatic bronchiectasis". *Annals of Thoracic Surgery* 98 (2014): 1034-1041.
4. Weycker D., *et al.* "Prevalence and economic burden of bronchiectasis". *Clinical Pulmonary Medicine* 12 (2005): 205-209.
5. Agasthian T., *et al.* "Surgical management of bronchiectasis". *Annals of Thoracic Surgery* 62 (1996): 976-978.
6. Bagheri R., *et al.* "Surgical management of bronchiectasis: analysis of 277 patients". *Thoracic and Cardiovascular Surgeon* 58 (2010): 291-294.
7. Caylak H., *et al.* "Surgical management of bronchiectasis: a collective review of 339 patients with long-term follow-up". *Thoracic and Cardiovascular Surgeon* 59 (2011): 479-483.
8. Kutlay H., *et al.* "Surgical treatment in bronchiectasis: analysis of 166 patients". *European Journal of Cardio-Thoracic Surgery* 21.4 (2002): 634-637.
9. O'Donnell AE. "Bronchiectasis". *Chest* 134 (2008): 815-823.
10. Fujimoto T., *et al.* "Current strategy for surgical management of bronchiectasis". *Annals of Thoracic Surgery* 72 (2001): 1711-1715.
11. Chalmers JD., *et al.* "Short- and long-term antibiotic treatment reduces airway and systemic inflammation in non-cystic fibrosis bronchiectasis". *American Journal of Respiratory and Critical Care Medicine* 186 (2012): 657-665.
12. Hiramatsu M., *et al.* "Risk factors that affect the surgical outcome in the management of focal bronchiectasis in a developed country". *Annals of Thoracic Surgery* 93 (2012): 245-250.
13. Jin YX., *et al.* "Surgical treatment of bronchiectasis: a retrospective observational study of 260 patients". *International Journal of Surgery* 12 (2014): 1050-1054.
14. Dogan R., *et al.* "Surgical treatment of bronchiectasis: a collective review of 487 cases". *Thoracic and Cardiovascular Surgeon* 37 (1989): 183-186.
15. Al-Refai RE., *et al.* "Surgical treatment of bronchiectasis: a retrospective observational study of 138 patients". *Journal of Thoracic Disease* 5 (2013): 228-233.

16. Coutinho D., *et al.* "Surgical treatment of bronchiectasis: A review of 20 years of experience". *Revista Portuguesa de Pneumologia* 22 (2016): 82-85.
17. Caylak H., *et al.* "Surgical management of bronchiectasis: a collective review of 339 patients with long-term follow-up". *Thoracic and Cardiovascular Surgeon* 59 (2011): 479-483.
18. Balkanli K., *et al.* "Surgical management of bronchiectasis: analysis and short-term results in 238 patients". *European Journal of Cardio-Thoracic Surgery* 24 (2003): 690-702.
19. Haciibrahimoglu G., *et al.* "Surgical management of childhood bronchiectasis due to infectious disease". *Journal of Thoracic and Cardiovascular Surgery* 127 (2004): 1361-1365.
20. Eren S., *et al.* "Risk factors affecting outcome and morbidity in the surgical management of bronchiectasis". *Journal of Thoracic and Cardiovascular Surgery* 134 (2007): 392-398.
21. Sirmali M., *et al.* "Surgical management of bronchiectasis in childhood". *European Journal of Cardio-Thoracic Surgery* 31 (2007): 120-123.
22. Zhang P., *et al.* "Surgical treatment of bronchiectasis: a retrospective analysis of 790 patients". *Annals of Thoracic Surgery* 90 (2010): 246-251.

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