Surgical Management of Bronchiectasis an Experience of 100 Cases

A BILAL M SALIM M S NABI *M. MUSLIM*
Department of Cardiothoracic Surgery, Postgraduate Medical Institute, Lady Reading Hospital
Correspondence to Dr. Aamir Bilal,

Objective: To observe the various clinical presentations of bronchiectasis and evaluate its surgical management and outcome. **Study Design**: An observational descriptive study. **Place and Duration**: Department of Cardiothoracic Surgery, Postgraduate Medical Institute, Lady Reading Hospital from July 2001 to January 2004. **Materials and Methods**: Computerized clinical data of 100 patients surgically managed during two and a half years was retrospectively analyzed. Detailed scrutiny of the record was carried out to determine various procedures done and analyze the clinical outcome. **Results**: A total of 100 patients underwent various surgical procedures. Male : Female ratio was 78 : 22, age range was 15–48 years with a mean age of 23.7 years. The predominant clinical presentations were productive cough in 55 (55%); recurrent chest infections in 30 (30%) and hemoptysis in 15(15%) patients. The mean operative time was 68 (40 ±) minutes. Seventy (70%) patients underwent lobectomy, 15(15%) pneumonectomy, 6 (6%) bilobectomy and lingulectomy in 5 (5%). Postoperative morbidity was 6 (6%). Three patients required ventilatory support postoperatively; prolonged air leak was noted in 2 and post-resection empyema in one patient. There was one mortality due to ventilatory failure. This was a 45 years old male patient who developed respiratory distress postoperatively and could not come off ventilator. Seventy two (72%) patients were asymptomatic in the follow-up, 24 (24%) experienced improvement in symptoms and in 4 (4%) patients symptoms were unchanged. **Conclusion**: Surgical resection for bronchiectasis can be performed with acceptable morbidity and mortality at any age.

Key words: Bronchiectasis, surgical management

Laennec first described brochiectasis in 1819 but it remained for Sicard and Forestier in 1922 to establish a method for accurately diagnosing the disease. They took Lipidol, an organically bound iodine preparation described by Lafay in 1901 and install it into the tracheobrochial tree by direct transcrisoid needle puncture[1,2]. Chest x-rays then demonstrated the radiopaque oil coating the tracheobronchial tree. Modification in contrast media and technique have occured. With the development of antibiotics in the 1940s, the disease has not been seen as frequently but with the emergence of drug resistant micro organisms and increasing frequency of drug resistant tuberculosis an increased incidence of post infectious bronchiectasis is being noted. The term bronchiectasis is derived from the Greek bronchus and Ektasis, meaning dilatation[3]. In the essence the term refers to the abnormal permanent dilatation of subsegmental air ways. Baker has emphasized that the pathophysiology of bronchiectasis requires an infectious process plus impairment of bronchial drainage, airway obstruction or a defect in the host defense airway. Obstruction can be caused by foreign body aspiration or enlarged lymph node compressing a bronchus. The etiological conditions can be divided into congenital and acquired. The most frequent congenital causes are cystic fibrosis congenital cystic bronchiectasis and Kartagener's syndrome. The most frequent acquired cause is secondary to an infectious process[4].

Clinical bronchiectasis is characterized by repeated episodes respiratory tract infection. The key symptom is cough with mucopurulent and tenacious secretions lasting months to years. This may be accompanied by intermittent hemoptysis, dyspnea, wheezing and pleurisy. It is most frequently characterized by clinically repeated episodes[5].

The most frequently used techniques in the diagnosis of bronchiectasis are imaging modalities and fiberoptic bronchoscopy. Before the advent of computed tomography (CT scan) a bronchogram was the standard procedure for diagnosis. A high resolution CT scan has replaced this procedure in the diagnosis of bronchiectasis. The detailed images demonstrate bronchial dilatation, peribronchial inflammation and parenchymal disease. The diagnosis can be with a 2% false negative and 1% false positive rate.

The treatment of bronchiectasis is largely medical and is directed towards prevention and control of infection and mechanical removal of purulent secretions by coughing, postural drainage and bronchoscopy. A long trial of medical therapy is appropriate to determine the need for surgical intervention. If medical treatment is unsuccessful and significant symptoms remain with recurrent episodes of pneumonitis, persistent purulent sputum production or frequent episodes of hemoptysis, surgical therapy should be considered.

The aim of our study was to evaluate the role of surgical intervention in bronchiectasis and determine the outcome in our circumstances.

Material and methods:

This is a retrospective analysis of patients operated for bronchiectasis between July 2001 and January 2004. Records of 100 patients who were subjected to operation were included in this study, while patients with wide spread generalized bronchiectasis, who had poorly localized target bronchiectatic areas on computed

tomographic scan were excluded. The hospital computerized records and operation reports of operated patients were carefully analyzed for demographic, features choice of operation, and outcome.

All patients underwent careful preoperative assessment and preparation for pulmonary resection. Pulmonary functions studies were obtained in all patients. Anesthesiologist and pulmonologist were consulted. Bacterial infections were cultured and treated with appropriate antibiotics. The volume of purulent sputum was reduced by programmed postural drainage and active physiotherapy.

Surgical technique: Active vigorous suction was done by the anesthesiologist at the induction of general anesthesia and thereafter to clear the airway of mobile secretions and blood. A double lumen endotracheal tube was used in all patients and was inserted before the patient was turned to the thoracotomy position. Endobronchial separation is vital to prevent contralateral spillage of purulent secretions mobilized during operation. Blood pressure, pulse and oxygen saturation were closely monitored during operation using pulse oximetry. Lung was mobilized and depending upon the extent of disease pneumonectomy, lobectomy, wedge resection or segmentectomy target pulmonary areas were isolated. Dissection of pulmonary artery for pneumonectomy was accomplished with No. "0" or 2/0 non-absorbable suture. Dissection and control of the superior and inferior pulmonary veins were done similarly. Individual ligation of pulmonary artery / vein bronchus was done for lobectomy and segmentectomy.

The main bronchus for pneumonectomy and lobar division for lobectomy was the last structure isolated in pulmonary resection. At operation bronchial stumps were kept long and excessive peribronchial dissection was avoided to preserve vascularity. Bronchial closure was accomplished with a non-absorbable monofilament Prolene No 2/0. One the closure was complete the stump was tested for any persistent air leak by covering the stump with a sterile solution and having the anesthesiologist apply or increase inspiratory pressure to that side of the tracheobronchial tree. The bronchial stump was covered with adjacent pleural, or pericardial tissue where required. All patients had tube drainage of the pleural space after operation. In pneumonectomy a single 32 F drain was retained for 24 hours while an apical and a basal drains were kept for lobectomy. Low pressure suction was applied in these patients for about a week. Patients were sent home on 10 to 15 days of operation and advised follow-up after 10 days.

Results:

Out of 100 patients there were 78(78%) males and 22(22%) females. Their mean age was 23.7 years (range 1 to 9 years). The most common symptoms were copious purulent sputum with cough in 55(55%), recurrent chest infections in 30(30%) and recurrent hemoptysis in 15(15%) patients (Table I). Pulmonary functions studies and computed tomography was obtained in all patients. In 70 patients FEV_1, FVC and FEV_1 / FVC were above 60% of the predicted values while in 10 patients these values were 50% of the predicted values. Computed tomographic scan (CT Scan) showed lower lobe bronchiectasis in 85(85%) cases and bilateral disease in 15(15%) patients.

Surgical procedures performed are depicted in Table II. Seventy (70%) patients underwent lobectomy, pneumonectomy in 15(15%), bilobectomy in 10 (10%) and lingulectomy in 5(5%) patients. Postoperative complications were noted in 6(6%) patients. Three patients required postoperative ventilatory support, prolonged air leak (>7 days) in one and post lobectomy empyema in one patient (Table III). There was one (1%) mortality. This was a 45 years old male who developed bronchospasm and respiratory distress postoperatively and could not come off ventilator. Follow-up data was obtained for 96 (96%) of the patients. Four patients were lost to follow-up. The mean follow-up of these patients was 4 months.

Follow-up showed that 72(72%) patients were asymptomatic, 24(24%) showed improvement in their symptoms and in 4(4%) patients symptoms were unchanged (Table IV).

Table I: Preoperative data of patients (n=100)

Variable	n=	%age
Sex		
Male	78	78
Female	22	22
Age (year)		
<40	63	
>40	36	
Clinical presentation		
Productive cough	96	
Recurrent chest infections	63	
Hemoptysis	54	

Table II: Surgical Procedures (n=100)

Procedure	n=	%age
Lobectomy	70	70
Pneumonectomy	15	15
Bilobectomy	10	10
Lingulectomy	05	5

Table III: Mortality and morbidity (n=100)

Mortality & Morbidity	n=	%age
Death	1	1
Complications	6	6
Bronchoscopy	3	
Prolonged air leak	2	
Post resection empyema	63	

Table IV: Clinical outcome after surgery (n=100)

Pathological findings	n=	%age
Asymptomatic	72	72
Improvement	24	24
Unchanged	04	04

Discussion:

The incidence of bronchiectasis has declined markedly in developed countries; however it is still a serious problem in developing countries. Bronchiectasis is a chronic disease of the lungs characterized by bronchial dilatation with associated infection of the bronchial walls and of surrounding pulmonary parenchyma[7,4]. The causative infection may be active or inactive at any given time but once the disease is established the bronchial dilatation and destruction remain while bronchiectasis may also be associated with bronchial obstruction on due to tumour, foreign body, external compression or bronchostenosis and may then occur in any lobe. Destructive pneumonitis may follow bacterial or viral infection of the lung, in some instances, foreign body aspiration. The pneumonitis that leads to bronchiectasis may sometimes be undiagnosed or inadequately treated[10]. As the destructive process heals, there is scarring and contraction of pulmonary parenchyma, leading to volume loss in the lobe and to circumferential traction on bronchi from scar contraction[11,12].

The usual case history of bronchiectasis is characterized by recurring cough, mucopurulent sputum and often hemoptysis. The sputum volume varies from a few milliliters a day to as much as 500 or 1000 ml daily. Hemoptysis usually appears late in the course of disease due to bronchial - pulmonary vascular communication. In our study 15% of patients experienced hemoptysis while 56% had purulent sputum productive, also noted by others[13,1,2].

In recent years, CT scanning has almost replaced bronchography as a radiographic method for localization of areas of bronchiectasis. In both children and adults CT scanning effectively localizes bronchiectasis in almost all instances[14,3]. CT scan was obtained in all our patients.

The initial management of patients with bronchiectasis is conservative. In many instances symptoms will be controlled and no surgical intervention will be necessary. If however the patient has recurrent pneumonia, complications of pulmonary infections, continuing copious sputum, hemoptysis or in children significant failure of growth; operative treatment should be considered.

Double lumen endotracheal tube was used in almost all of our patients. During surgery head down position, frequent suction of endotracheal tube and invasive monitoring was done. Pleural cavity was washed with saline & bronchial stump checked. Meticulous closure of thoracotomy wound with Vicryl 2 & a preserved serratus anterior resulted is better wound healing. Single chest drain connected to underwater seal, for 24 hours to reveal any haemorrhage was done in all cases. Drain was not clamped as in inflammatory lungs, mediastinum is already fixed and clamping only conceals internal haemorrhage. It is removed as early as 24 hours to avoid ascending infection. Postoperatively these patients are monitored in ICU and HDU. Chest physiotherapy and early mobilization is encouraged.

Many of the early multistage resections and drainage of the pulmonary tissue were for bronchiectasis. It remained for Brwnn in 1929 to show that one stage lobectomy could be done with relative safety. The extent of surgical resection for bronchiectasis should be planned well in advance on the basis of CT scanning; bronchoscopic findings and pulmonary function testing. In most cases, unilateral resection will suffice but in about 10% of patients, bilateral resection will be necesary[15]. A detailed evaluation of pulmonary function is especially important in this group. If a bilateral procedure is planned the most seriously involved side should be resected first. The patient should be prepared for operation with careful tracheobronchial toilet and specific antibiotics [16,2,3]. Bronchiectasis is a disease of anatomic bronchial segments and may involved one or all broncho pulmonary segments. Resection of a single segment is rarely justified, however resection of two segments specifically right middle lobectomy or lingulectomy; done in 5 patients of our study, is also reported by the series [6,17,2]. The technique of surgical resection for bronchiectasis requires a thorough knowledge of segmental anatomy if all disease is to be removed while preserving all normal pulmonary parenchyma - the goal of this kind of surgery. Meticulous hemostasis is mandatory; trouble some operative and postoperative bleeding may occur from bronchial vessels. After careful ligation and division of the pulmonary vessels, the appropriate bronchus or bronchiole; are divided. Meticulous closure of the stump with non-absorbable suture material is required. The stump should be covered with pedicle flap of parietal pleura when ever possible[18,7].

In properly selected and managed patients the mortality following resection for bronchiectasis should be 1% or less as has been the case in recent series [1,2,4]. In our study there was one (1.25%) mortality. On would expect about 80% of patients to become asymptomatic postoperatively. About 15% will be improved but still have residual symptoms five percent will be unimproved or worse. In our study in accordance with other studies[4,2], 72% patients became asymptomatic, 24% showed improvement in their symptoms and 4% were unchanged.

Conclusion:

Surgical treatment of bronchiectasis is more effective in patients with localized disease. Surgery for bronchiectasis can be performed with acceptable morbidity and mortality. Complete resection should be done when ever possible. Most patients are extremely grateful following pulmonary resection for bronchiectasis and they often express the wish that they had undergone operation earlier in their course of disease. Moreover pulmonary resection of bronchiectasis does not alter respiratory function.

Acknowledgments: The writer thanks Dr. Muhammad Shoaib Nabi, Assistant Professor Thoracic surgery for study design and statistical analysis.

References:

1. Haciibrahimoglu, Fazlioglu M, Olcmen. Surgical management of child hood bronchiectasis due to infections disease. J Thorac Cardiovasc Surg, 2004; 127 (5): 1361 – 5.
2. Balkanli K, Genc O, Dakak M Gurkok S, Caylak H. Surgical management of bronchiectasis: Analysis and short term results in 238 patients. Eur J Cardiothroac Surg, 2003; 24(5): 699 – 702.
3. Nazieres J, Murris M, Didier A et al. Limited operation for severe multisegmental bilateral bronchiectasis. Ann Thorac Surg, 2003; 75 (20): 382 – 7.
4. Kutlay H, Cangir AK, Enon S et al. Surgical treatment in bronchiectasis: Analysis of 166 patients. Eur J Cardiothorac Surg, 2002; 21(4): 634 – 7.
5. Fujimoto T, Hillejan L, Stamatis G. Current strategy for surgical management of bronchiectasis. Ann Thorac Surg, 2001; 72(5): 1711 – 5.
6. Ayed A. Pulmonary resection for massive hemoptysis of benign etiology. Eur J Cardiothorac Surg, 2003; 24(5): 689.
7. Pjeto D, Bernardo J, Matos MJ et al. Surgery for bronchiectasis Eur J Cardiothorac Surg, 2001; 20(1): 19 -23.
8. Fidan A, Ozdogan S et al. Hemoptysis: A retrospective analysis of 108 cases. Resp Med 2002; 96(9): 677 – 80.
9. Weber A, Stammberger U, Inci I et al. Thoracoscopic lobectomy for benign disease – a single centre study on 64 cases. Eur J Cardiovasc Surg, 2001; 20(3): 443 – 8.
10. Agasthian M et al. Surgical management of bronchiectasis. Ann Thorac Surg 1996; 62 : 976.
11. Ashour M. Hemodynamic alternative in bronchiectasis: a base for new subclassification of disease. J Thorac Cardiovasc Surg, 1996; 112: 328.
12. Cole F H et al. Management of bronchiectasis: Is thoracotomy necessary? Ann Thorac Surg, 1986; 42: 225.
13. Wagner RB, Johnson MR. Middle lobe syndrome. J Thoracic Surg, 1983; 35: 679.
14. Sanderson JM et al. Bronchiectasis: results of surgical and conservative management. A review of 393 cases. Thorax, 1974; 29: 407.
15. Hodder RV, Cameron R, Todd TRJ. Bacterial infections. In Pearson FG et al. Thoracic Surgery, New York; Churchill living stone, 1995.
16. Dogan R. Surgical treatment of bronchiectasis. A collective review of 487 cases. Throac Cardiovasc Surg, 1989; 37: 183.
17. Baker AF. Bronchiectasis: Semin Thorac Cardiovasc Surg, 1995; 7: 112.
18. Annest LS, Kratz JM. Current results of treatment for bronchiectasis. J Thorac Cardiovasc Surg, 1982; 82: 546.