Surgical Management of Bronchiectasis

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Abstract:

Background: Bronchiectasis is the permanent dilatation of the bronchi due to destruction of bronchial wall. Bronchiectasis still remains a serious problem in developing countries despite modern medical facilities. Objectives: This study aims to demonstrate our surgical experience for bronchiectasis and analyze the risk factors related with the surgery outcome. Methods: Hospital based analyses of 39 patients were done who were underwent surgery for bronchiectasis and were on follow up in National Institute of Diseases of Chest hospital (NIDCH) in September 2014 to February 2015 were included in this study. All 39 patients had surgery for the bronchiectasis in the period of January 2014 to December 2014. Results: The mean age of the patients were 22.2 years. Twenty four patients were females and 15 were male. Symptoms were recurrent infection with cough, copious sputum in all patients and hemoptysis in 31 patients. The etiology was recurrent childhood infection in 17 patients, pneumonia in 11 patients, PTB in 6 patients, Aspiration in 2 patients, foreign body obstruction in 1 patient, and unknown etiology in 2 patients. Chest x-ray, CT scan and rigid bronchoscope were done for all patients. Bronchiectasis was left-sided in 17 patients. It was mainly confined to the lower lobes either alone in 9 patients and in conjunction with middle lobe or lingual in 8 patients. Indications for resection were failure of conservative therapy in 22 patients, hemoptysis in 8 patients, destroyed lung in 9 patients. Surgery was lobectomy in 24 patients, Bilobectomy in 5 patients, and pneumonectomy in 10 patients. Complications occurred in 10 patients with no operative mortality. Thirty four patients had relief of their preoperative symptoms after surgery in follow up periods. Conclusions: Surgical resection for bronchiectasis should be reserved for patients with localised disease who have failed medical management and have persistent symptoms that negatively affect their quality of life.

Keywords: Bronchiectasis, lobectomy, pneumonectomy.

Introduction:

Bronchiectasis is an irreversible dilatation of bronchial tree resulting from destruction of the bronchial wall. Bronchiectasis was first described by Laenec in 1819 and, before the antibiotic era, it was considered a morbid disease with a high mortality rate from respiratory failure⁴. The clinical presentation varies and may involve repeated respiratory infections alternating with asymptomatic periods or with chronic production of sputum. Bronchiectasis should be suspected especially when there has been no exposure to tobacco smoke. The sputum mixed with blood or there is recurrent hemoptysis⁵.

Today, with the improvement of health care and the availability of suitable antibiotics, the prevalence of bronchiectasis has declined and the patients with early disease can be treated successfully by conservative procedures in. Bronchiectasis still constitutes an important problem in developing countries because of tuberculosis, pneumonia, pertussis and serious rubella infections⁶. Current reports about the surgical management for bronchiectasis show that limited localized disease is associated with good postoperative outcome⁷.

This study was designed to analyze the cases of bronchi-
actesis in our tertiary level hospital in regards to presenta-
tion, etiology, diagnostic aproaches, indications for 
surgery, surgical approach, and the outcome.

Methods:

We retrospectively reviewed the medical documents and 
took the perioperative history of 39 patients who under-
went surgical resection for bronchiectasis between 
January 2014 to August 2014, at the Department of 
Thoracic Surgery in National institute of Chest Disease 
Hospital (NCDH). These 39 patients were in follow up in 
thoracic surgery OPD from September 2014 to February 
2015. Variables of age, sex, symptoms, etiology of 
bronchiectasis involved, inductions and types of surgery, 
mortality, morbidity and the result of surgical therapy 
were analyzed.

Pre operative Chest radiography (CXR), computed 
tomography of the chest (CT) (Fig-1) and pulmonary 
function tests were reviewed to evaluate the type, severity, 
and distribution of bronchiectasis. All patients had inten-
sive chest physiotherapy, sputum culture and sensitivity 
tests. Preoperative Chest physiotherapy was continued 
until the daily volume of the sputum decreased to 30 mL 
or less. Rigid bronchoscope was performed for all patients 
for the removal of secretion and determining foreign body 
or endobronchial lesions and identifying the other causes of 
haemoptysis. The bronchial aspirate was sent for 
microbiologic culture. Prophylactic antibiotics were given 
for 48 hours prior to surgery to prepare all patients under-
going surgery.

Operations were carried out under general anaesthesia 
with a double-lumen endotracheal tube to avoid contami-
nation by secretions to opposite lung. Posterolateral thora-
cotomy was used for all patients. Surgical resection was 
performed on the basis of area of affection of pulmonary 
tissue assessed by preoperative Chest CT scan. If the 
disease was limited to one lobe, lobectomy was done and 
when the whole lung was affected, pneumonectomy was 
performed. In some cases lingullectomy was also required. 
During pulmonary resection, excessive bronchial dissec-
tion was avoided, and peribronchial tissues were 
 preserved. The bronchial stump was closed by using a 
polypropylene suture in two layers. All resected speci-
mens were sent for histo-pathological examination in 
order to confirm the diagnosis.

Retrospective recording of pre-surgical data included 
demographic information, medical comorbidities, and 
symptoms of presentation, side and location, rigid 
bronchoscopy data, spirometry data, indication for 
surgery. We also collected data about the extent of resec-
tion and the postoperative morbidity. History obtained 
from all 39 patients at follow up and review of documents, 
showed that all patients received intensive chest physi-
otherapy, antibiotics and analgesics in post operative 
periods.

Results :

A total of 39 patients were reviewed who were underwent 
surgical treatment for bronchiectasis in our department 
from January 2014 to August 2014. The mean age of these 
patients was 22.2years. Female to Male ratio was 24/39. 
All patients were symptomatic. The presenting symptom 
was recurrent infection with productive cough in all 
patients. Copious amount of sputum and recurrent hemop-
tysis was found 31 patients. The duration of symptoms 
ranged from one to 9 year (mean ±SD 3.7±2.3 years). The 
possible etiologies of bronchiectasis, symptoms,side and 
lobe affected were listed in Table 1.

Postero-anterior and lateral chest X-ray and CT scan were 
done for all patients, but the diagnosis of bronchiectasis 
was based mainly on the chest CT scan finding. It deter-
mines the type and extent of bronchiectasis, rigid 
bronchoscope was performed in all patients. The disease 
was on left side in 17 patients and on the right side in 12 
patients. The disease was bilateral in 10 patients. Bronchi-
ectasis involvement was predominantly in the lower 
lobes. The left lower lobe was affected in 9 patients and 
right lower lobe in 8. (Table 1).

The indications for pulmonary resection were failure of 
medical therapy in 21 patients, recurrent or massive
hemoptysis in 10 patients, collapse, and consolidation in 8 patients (Table 3). Posterolateral thoracotomy and complete resection of all diseased segments were performed in all patients except in patients with bilateral disease. Seventeen patients had a lobectomy, 8 patients had a bilobectomy, 1 patient had lingulecctomy, and 7 patients had a pneumonectomy (Table II).

Complications occurred in 10 patients and included postoperative bleeding (in 4 patients) that required exploration in 1 patient and atelectasis requiring bronchoscopic suction in 3 patients, a persistent air leak (more than 7 days) in 1 patient and this patient was proved to have bronchopleural fistula later on, post pneumonectomy space infection in 3 patients, wound infection in 1 patient, and post operative space collection in 1 patient.

Follow-up data were obtained for 39 of the patients. The mean follow-up of these patients was 4.5 months (range from 1 to 11 months). The symptoms disappeared in 32 patients and 5 patients had residual symptoms and controled by antibiotic. During the follow up period, 2 patients developed recurrent hemoptysis. These 2 patients were considered for further resection. Among 2 patients, 1 patient had left lower lobectomy and in follow up, this patient was planned for left side pneumonectomy. Right lower lobectomy was planned for another 1 patient for whom middle lobectomy was done because of frequent re-admission due to recurrent chest infection and hemoptysis after 5 months of follow up.

### Table-I

_Etiology, symptoms, side and lobe of Bronchiactasis._

<table>
<thead>
<tr>
<th>variables</th>
<th>Numbers</th>
<th>percentage</th>
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<tbody>
<tr>
<td>Symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>39</td>
<td>100%</td>
</tr>
<tr>
<td>Recurrent infection</td>
<td>39</td>
<td>100%</td>
</tr>
<tr>
<td>Sputum</td>
<td>39</td>
<td>100%</td>
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</table>

### Hemoptysis

Causes of bronchiactasis

<table>
<thead>
<tr>
<th>Causes</th>
<th>Number</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Recurrent childhood infection</td>
<td>17</td>
<td>43.5%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>11</td>
<td>28.2%</td>
</tr>
<tr>
<td>TB</td>
<td>06</td>
<td>15.3%</td>
</tr>
<tr>
<td>FB</td>
<td>01</td>
<td>2.56%</td>
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<tr>
<td>Unknown</td>
<td>02</td>
<td>5.12%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Side</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>17</td>
<td>43.5%</td>
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<tr>
<td>Right</td>
<td>11</td>
<td>28.2%</td>
</tr>
<tr>
<td>Bilateral</td>
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<td>28.2%</td>
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Lobe affected

<table>
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<tr>
<th>Lobe affected</th>
<th>Number</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Left lower lobe</td>
<td>09</td>
<td>23%</td>
</tr>
<tr>
<td>Right lower lobe</td>
<td>07</td>
<td>17.9</td>
</tr>
<tr>
<td>Middle lobe</td>
<td>03</td>
<td>7.69%</td>
</tr>
<tr>
<td>Left upper lobe</td>
<td>01</td>
<td>2.56%</td>
</tr>
<tr>
<td>Right upper lobe</td>
<td>01</td>
<td>2.56%</td>
</tr>
<tr>
<td>Right lower and middle lobes</td>
<td>08</td>
<td>20.51%</td>
</tr>
<tr>
<td>Lingual</td>
<td>03</td>
<td>7.69%</td>
</tr>
<tr>
<td>Left lower lobe and lingual</td>
<td>02</td>
<td>5.12%</td>
</tr>
<tr>
<td>Right upper lobe and middle</td>
<td>02</td>
<td>5.12%</td>
</tr>
<tr>
<td>Left pneumonectomy</td>
<td>03</td>
<td>7.69%</td>
</tr>
<tr>
<td>Right pneumonectomy</td>
<td>04</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

T.B = Tuberculosis, FB = Foreign Body

### Table-II

_Indications, Types and complications of surgery_

<table>
<thead>
<tr>
<th>Variables</th>
<th>No of patients</th>
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<tbody>
<tr>
<td>Surgery</td>
<td></td>
</tr>
<tr>
<td>Lobectomy</td>
<td>24</td>
</tr>
<tr>
<td>Lower lobe</td>
<td>15</td>
</tr>
<tr>
<td>Upper lobe</td>
<td>05</td>
</tr>
<tr>
<td>Middle</td>
<td>04</td>
</tr>
<tr>
<td>Segmentectomy (Lingula)</td>
<td>03</td>
</tr>
<tr>
<td>Bilobectomy</td>
<td>08</td>
</tr>
</tbody>
</table>
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Left lower lobe and lingula 03
Right upper and middle lobes 02
Right lower and middle 03
Pneumonectomy 07
Complications 10
Post-operative hemorrhage 03
Persistent air leak 01
Post pneumonectomy space infection 03
Broncho-pleural fistula 01
Wound Infection 01
Post op space collection (Effusion) 01

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**Table-III**

*Indication for surgery*

<table>
<thead>
<tr>
<th>Indications of surgery</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure of medical treatment</td>
<td>21</td>
</tr>
<tr>
<td>Massive or recurrent hemoptysis</td>
<td>10</td>
</tr>
<tr>
<td>Destroyed lung</td>
<td>08</td>
</tr>
</tbody>
</table>

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**Fig-1:** Chest CT scan showing bilateral cystic Bronchiectasis in the lower lobes.

**Fig-2:** Chest CT scans showing the Bronchiectasis in the right middle lobe.

**Fig-3:** CT chest shows left upper lobe Bronchiectasis.

**Fig-4:** 3D reconstruction CT scan of chest showing Bronchiectasis in right lung.

**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 respiratory failure. It is usually caused by pulmonary infections or bronchial obstruction. The incidence of bronchiectasis is unknown. The prevalence of bronchiectasis decreased significantly over recent decades due to the proper use of antimicrobial therapy and immunization against viral and bacterial agents. Early
The recognition of foreign bodies with bronchoscopy also decreased the incidence of post-obstructive bronchiectasis. However, the incidence of bronchiectasis is still high in developing countries. In spite of the advances in thoracic surgery, the optimal treatment for bronchiectasis remains controversial.

Vendell and colleagues reported different causes of bronchiectasis including post infection, bronchial obstruction, immune deficiency, impaired mucociliary clearance, inflammatory pneumonitis, structural airways abnormalities and association with other disease. They also reported that the cause remains unknown in a fairly high percentage of patients ranging from 26% to 53%.

Recurrent pulmonary infection was most common cause in our 17 patients; pneumonia either in childhood or adulthood was the cause in our 11 patients, pulmonary tuberculosis in 6 patients and foreign body obstruction in 1 patient. Unknown etiology was in 2 patients (5.12%) which is less in our study then other study. In our study, there was mixed etiologies.

Patients with bronchiectasis typically present with recurrent respiratory tract infections, productive cough, bronchial suppuration and purulent bronchorrhea. Cough, purulent and fetid sputum, and hemoptysis are the most common symptoms in other series.

Diagnosis of bronchiectasis is based on clinical history and CT scan findings. All the patients in our study had done CT scan of chest. CT criteria for diagnosis of bronchiectasis are well established (internal diameter of the bronchus more than 1.5 times than that of accompanying artery and evidence of lack of tapering of bronchi). Bronchoscopy is not a main diagnostic method for bronchiectasis, but it may be helpful in identifying and removing foreign bodies, for locating the site of bleeding in patients with hemoptysis, and for diagnosing narrowed bronchi or neoplasms. Preoperative bronchoscopy should be routinely done to rule out benign or malignant cause of obstruction. In our study, rigid bronchoscopy was performed for all patients for the above mentioned reasons in addition to preoperative cleaning of the tracheobronchial tree in preparation of the selected patients for surgery.

In general, bronchiectasis affects most dependent portions of the lung, which includes posterior basal portions 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. In our study, the disease affected the left lung in 17 patients. It was mainly confined to the lower lobes alone in 9 patients or in conjunction with middle lobe or lingual in 8 patients.

The initial treatment strategy for all patients with this disease should be conservative. Infection control, bronchodilatation and chest physiotherapy with postural drainage were the main components of conservative treatment. If medical treatment is unsuccessful or frequent episodes of hemoptysis exist surgical therapy should be considered. As was the case with other series, the indications for surgery in our study were failure of medical therapy, recurrent or massive hemoptysis, collapse with consolidation on radiological findings.

The goals of surgical therapy for bronchiectasis were to improve the quality of life and to resolve complications such as recurrent respiratory tract infection, severe or recurrent hemoptysis, and lung abscess. There was also consensus that, because bronchiectasis is a progressive disease, affected regions should be resected in a way that preserved uninvolved lung parenchyma, and early pulmo-
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Complete and anatomical resection should be done with preservation of as much lung function as possible.

Therefore every type of resection is possible for these purposes. Ultimately, a minimum of two lobes or six pulmonary segments must be spared to ensure adequate pulmonary function. For successful surgery, Kutly and colleagues recommend that the operation should be performed in ‘dry period’, complete resection of suspected areas by intraoperative examination that could not be determined by radiological examination to decrease relapse rates, and after lung resection in childhood lung can still grow to occupy the space.

Apart from the 7 patients who underwent pneumonectomy for collapse with consolidation (destroyed lung), most of our patients had a localized disease to one or more lobe. Complete resection was achieved in 37 patients. Bilateral bronchiectasis a contraindication to surgical therapy in selected patients. In our series, 10 patients had bilateral bronchiectasis. A staged thoracotomy for these patients was performed.

Complication occurrence is 9.4-24.6% in the current literature; our result was 25.64% therefore our result (10 patients) is within the reported incidence. It included early and late complications. Early complications included bleeding requiring exploration, post space infection, and prolonged air leak more than 7 days and the late one included the recurrence of symptoms and extension into other lobes or segments. Apart from the patient developed bronchopleural fistula, all complications were successfully treated. That patient developed post pneumonectomy space infection with persistent air leak and was proved to have bronchopleural fistula, was re-admitted 8 months after surgery with persistent air in post pneumonectomy space, recurrent pus collection, and chest infection. Mortality ranges from 0% to 8.3% in the literature and current mortality is less than 1% 10,12. There was no operative mortality in our study.

In our study, patients with complete resection of a localized bronchiectasis had better outcomes than those with incomplete resection. Regarding symptoms, the results of surgery can be considered satisfactory in our experience. More than 82% of our patients had relieved their preoperative symptoms. These results are similar to other series 10,12.

The follow up time was short as we depend mainly on the outpatient department visits. Our center is a referral center that covers a wide area and most of the patients with improvement of symptoms lost to follow up as they are far from the center and their concept that they need no more follow up.

Conclusion:

In conclusion, surgical resection of bronchiectasis can be performed with acceptable morbidity and without mortality of any age for localized disease by proper selection and preparation of the patients. Complete resection of the involved sites are required for the optimum control of symptoms and better outcome.

References:


