



## Original Article

# CT Evaluation of Unilateral Destroyed Lung among Bangladeshi Population

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### Abstract

The unilateral destroyed lung is an important cause of morbidity and mortality. The commonest cause of destroyed lung is total post tuberculous sequelae. Primary lung tumors, mediastinal masses, vascular abnormalities, and some others are considered to be other causes of lung destruction. A study was undertaken at the National Institute of Diseases of the Chest and Hospital (NIDCH) on 600 cases from January 2016 to December 2020 to evaluate the etiopathogenesis of unilateral lung destruction and to evaluate hilar structures & the nature and extent of parenchymal damage. The study was performed on 600 patients with unilateral lung destruction, of whom 416(69.33%) had left lung destruction. Pulmonary tuberculosis was found to be the cause in 504(84%) patients. All patients had an X-ray chest and CT scan of the chest (contrast CT/ HRCT). However, 96(16%) non-tuberculous patients had their main bronchi occluded with extraluminal compression or by the intraluminal lesion.

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### Introduction

The expression of “destroyed lung” is now accepted to designate the large destruction of the lung, secondary to parenchymal and essentially infectious diseases, the cure of which is obtained but with important sequelae. The main cause of which remains tuberculosis.<sup>1</sup>

Caseation, liquefaction, cavity formation, progressive lung destruction, and fibrosis are the hallmarks of reinfection tuberculosis. Apical and sub-apical pulmonary areas are the vulnerable regions where tubercle bacilli survive and cause a destructive lesion.<sup>2</sup>

Apical tuberculosis occurs commonly both in endogenous reactivation and exogenous reinfection.<sup>3</sup> Predominant upper lobar cavities and destructive lesions in tuberculosis have been well documented.<sup>4,5</sup> However, tissue destruction is not

restricted to upper lobes alone, and unilateral massive lung destruction is found to occur after either primary or reinfection tuberculosis.<sup>6</sup> Current interest in such unilateral lung destruction is focused on microbial persistence and MDR TB.

In countries with an underdeveloped health care system, end stages of tuberculosis resulting in the complete destruction of a whole lung or a major part of a lung is not uncommon—this kind of damage results from a combination of parenchymal and airway involvement. The secondary pyogenic or fungal infection may supervene. Once the lung is destroyed, the activity of tuberculosis is difficult to assess with radiologic studies.

Other causes include bronchial carcinoma, mediastinal tumor, final phase bronchiectasis, necrotizing pneumonia. Rare causes are

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hypoplastic lung, pulmonary actinomycosis, pulmonary gangrene, and infection by non-tuberculous mycobacteria.<sup>15</sup>

Patients with destroyed lung usually present with prolonged & repeated events of respiratory infections, occasional hemoptysis, low-grade fever, generalized ill health, but they may present with acute symptoms of septicemia, massive hemoptysis or respiratory failure.

Chest X-ray & CT scans (CECT/HRCT) are the mainstay in the detection of the destroyed lung. Chest radiograph features of the destroyed lung include opaque hemithorax with ipsilateral mediastinal shifting and herniation of the contralateral lung. Crowding of ipsilateral ribs resulting in a reduction of intercostal spaces is also evident. Bronchiectasis, pleural thickening are frequently associated.

Chest radiographic features are more clearly depicted in computed tomography. Cicatrization atelectasis, fibrosis, bronchiectasis, pleural thickening, tracheobronchial stenosis, cavities, aspergilloma, concurrent bronchial malignancies are found. Hypertrophied bronchial arteries, Rasmussen aneurysms are the complications in the tuberculous destroyed lung, which may result in life-threatening hemoptysis.<sup>16</sup>

The present study was undertaken to evaluate the causes for unilateral lung destruction; to evaluate the main bronchus and the hilar structures on the affected side by CT; to study the proportion of chronic tubercle bacilli excretors with unilateral lung destruction, and to assess the type and extent of tissue damage

## Materials and Methods

The patients attending the respiratory medicine and surgery department of NIDCH, Dhaka, Bangladesh, from January 2016 to December 2020 with clinical and radiological features suggestive of unilateral lung destruction were selected for the present study. All these patients had either unilateral lung destruction alone with another lung healthy or with lesions in the contralateral lung. Apart from the routine examination- all these patients were subjected to the following investigations-

1. Sputum for AFB and culture
2. X-ray chest P/A and lateral views
3. Contrast CT/ HRCT of the chest with reconstruction images.

### Observations and results:

In this study group, the age range was from 07 to 78 years; among them, the highest number of patients was in the 20 to 40 years group. The male to female ratio was 1.1: 1. Causes of unilateral lung destruction in these study groups were pulmonary tuberculosis-504(84%), bronchogenic carcinoma- 74 (12.33%), and mediastinal tumor- 22 (3.6%). Left lung destruction was observed in 416(69.33%), among which pulmonary tuberculosis was detected in 364 (87.5%) cases. Radiological common findings observed were a combination of fibrosis, fibrotic nodules, bronchiectasis, bronchiectatic cavity, bullae, aspergilloma, volume shrinkage, pleural thickening/ calcification, etc.

**Table 1. Predisposing factor for unilateral lung destruction**

Cause	Right lung		Left lung		Total	
	Patients	%	Patients	%	Patients	%
PTB	140	76.08	364	87.5	504	84
Ca bronchus	34	18.48	40	9.6	74	12.33
Mediastinal tumor	10	5.4	12	2.88	22	3.6
Total	184	100.0	416	100.0	600	100.0

**Table 2: Pulmonary tuberculosis and unilateral lung destruction**

Type of patient	Right	Left	Total	%
Newly diagnosed (Sputum positive)	63	72	135	26.78
Previously treated (Sputum positive)	62	91	153	30.35
Previously treated (Sputum negative)	15	201	216	42.85
Total	140	364	504	100.0

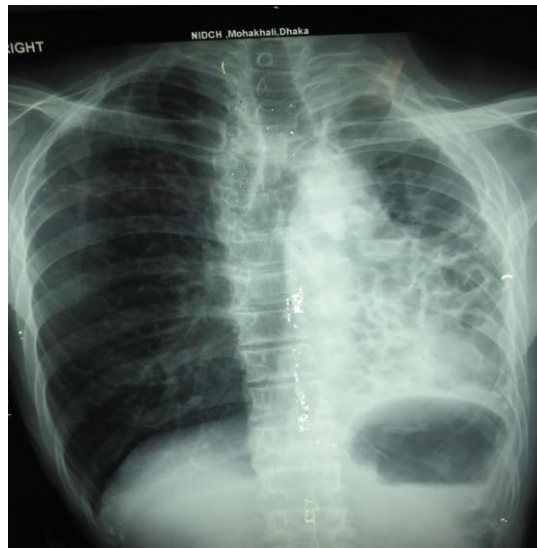


Figure 1: X-Ray Chest showing destroyed left lung

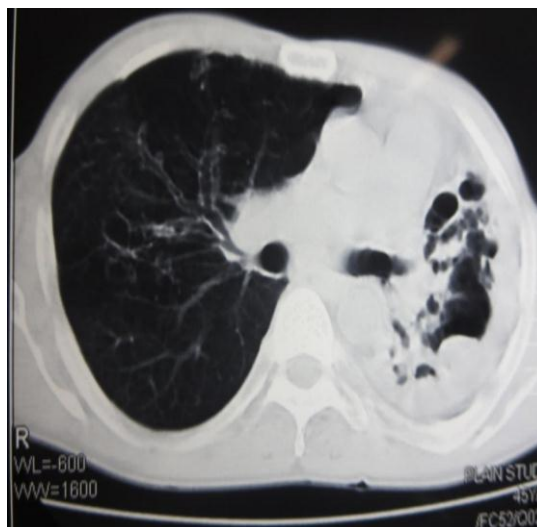


Figure 2: CT scan of chest showing destroyed left lung



Figure 3: CT scan of chest showing destroyed right lung

## Discussion

The destroyed lung is defined as large destruction of lung parenchyma due to many causes, the commonest of which is infectious. Unilateral tuberculous lung destruction has been a recognized entity.<sup>6,7</sup> It may occur after a primary disease or reinfection.<sup>6</sup> These patients either report for the first time for diagnosis or after completion of treatment or are referred as non-responder to anti TB treatment because of the persistence of drug-resistant organisms. In our study, tuberculosis is responsible in 504(84%) cases. A study was done by SR, VV, DJ on 66 patients from the 1996 to 1998 period, results of which correlate well with us( PT was responsible in 83.3% of cases).<sup>8</sup> In a series of 46 patients operated on as a result of lung destruction between 1976 and 1988, Kao found that the origin was pulmonary tuberculosis in 80% of cases.<sup>14</sup> Their findings were similar to ours.

Left lung destruction (416 out of 600 cases) was 69.33% in our study, which also correlates well with the study performed by the same group, and that was 69.7%.<sup>8</sup> In another case series, left lung involvement was found in the majority of patients with destroyed lung (80%).<sup>17</sup> A combination of anatomical factors may make the left lung more vulnerable to this type of damage, and disordered hemodynamics also appear to play a part. The left

main bronchus is considerably longer and 15% narrower than the right.<sup>9,10</sup> The peribronchial space is limited by its proximity to the aorta,<sup>11</sup> so it is more prone to obstruction enlargement of adjacent lymph nodes. In addition, the more horizontal course of the left main bronchus than of the right may have an effect on drainage of secretion.<sup>8</sup> Reduction of pulmonary arterial blood flow to the destroyed lung resulting in reduced chemotherapeutic agents to the affected sites causing the ineffective killing of tubercle bacilli. This necessarily results in microbial persistence leading to relapsed tuberculosis and treatment failure with MDR TB, especially among those with lung destroyed.<sup>12</sup>

The destroyed lung may cause severe complications such as massive hemoptysis, septicemia, and left-right shunt requiring urgent medical attention. The shunt can produce pulmonary hypertension and respiratory failure despite having a normal contralateral lung. On some occasions, secondary infections & empyema may complicate the clinic, hindering the treatment.<sup>13</sup>

## Conclusion:

Inadequate and insufficient treatment for pulmonary tuberculosis and improper follow-up creates a background for the destruction of the lung. The most common cause of destroyed lung is

the long-term sequelae of pulmonary TB, which can be evaluated both by X-ray and CT scan. CT scan can evaluate the lung condition in detail, which is very much needed for treatment planning such as pneumonectomy to avoid further complications. Chest radiograph & CT scans also play a critical role in detecting the bronchial neoplasms, mediastinal masses. Diagnosis, follow-up, monitoring treatment outcome & prognostication of the disease is vastly dependent on radiology. The accurate and timely detection of destroyed lung & its complication can significantly reduce mortality- morbidity of patients & thereby reduce the burden of prolonged and repeated hospitalization.

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