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# AN OVERVIEW OF MICROSCOPIC IMAGING TECHNIQUE FOR LUNG CANCER & CLASSIFICATION

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**ABSTRACT**
Lung cancer detection is still a global problem in biomedical field. The rate of lung cancer has been increasing every year. Although there are different techniques which physicians follows such as X-ray, CT, HRCT, PET and MRI, but still the success rate for diseases detection is very less. All though physicians take their decisions by analyzing, visualizing, and comparing the results obtained from all the above mentioned imaging techniques to reach any conclusion, but still the task is very tough one and most of the time physicians experience as well as the medical history of the patient also plays an important role in the whole process. This paper highlights on overview of an electron microscopy lung cancer imaging.

## INTRODUCTION

Before understating the microscopic lung images for diseases detection, it is necessary to understand the anatomy and histology of lungs as well as the human respiratory system [10]. Also the detailed study of various lung diseases such as Interstitial Lung Disease (ILD) & Asbestos, Asthma, Emphysema, Fibrosis, Chronic Obstructive Pulmonary Disease (COPD) and Other cancers of the airways, including the esophagus and larynx with their symptoms[6].

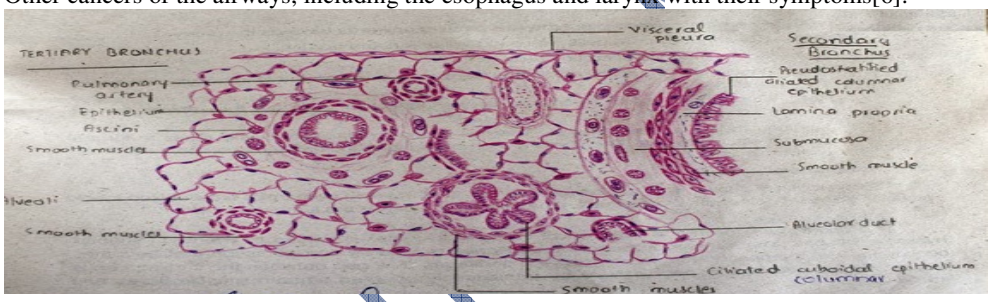


**Figure1.1 Lungs High resolution Histology Diagram**

The electron microscope is a type of microscope that uses a beam of electrons to create an image of the specimen. It is capable of much higher magnifications and has a greater resolving power than a light microscope, allowing it to see much smaller objects in finer detail [2]. They are large, expensive pieces of equipment, generally standing alone in a small, specially designed room and requiring trained personnel to operate them. The microscopic lung images are taken through Electron microscopy, which is a powerful microscope that allows the researchers to view the specimen at nano scale level. Small pieces of tissue is taken from the lung, embedded in paraffin, cut thin, placed on a glass slide, and stained. The resulting preparations are examined under microscope for lung diseases analysis. Figure 1.1 shows the normal lung observed under electron microscope with low magnification view. It has small airways (bronchioles (B)) with adjacent branches of the pulmonary artery (A). The blood flows from the arteries into fine capillaries in the alveolar walls. The blood then flows into the pulmonary veins (V) that carry the oxygenated blood back to the heart. A healthy lung means clear air sacs, Bronchioles and strong gas exchanging and cleaning capacity [8].

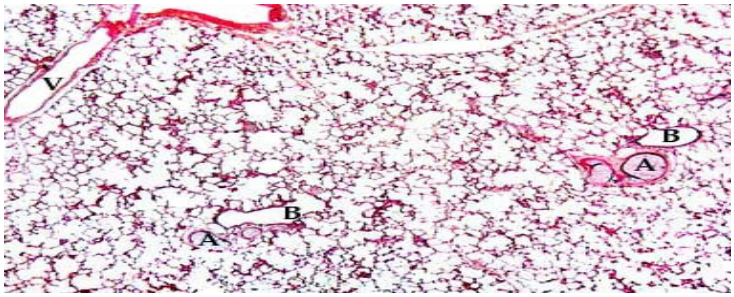


**Figure 1.2 Normal Lungs on Microscopy under Low Magnification View [9]**

Figure 1.3 is smoker's lung under microscope. In order to observe the abnormality, we have to magnify it number of times to get some visual look about the diseases. Figure shows small airway (bronchiole), a structure that is often damaged by cigarette smoke. It is lined by a single layer of cells (epithelium) that have cilia on the surface [1]. Also, the airway wall has multiple alveolar walls attached to it. These walls are elastic and serve to keep the airway open during expiration, as the amount of air in the lungs decreases.

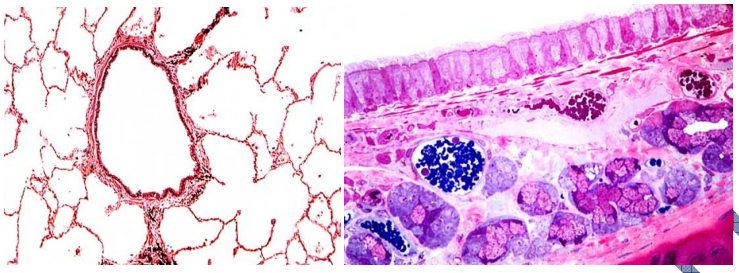

**Figure 1.3 smokers Lung on Microscopy under Low Magnification View [9]**

Higher magnification of the epithelium lining a large airway shows the delicate, fuzzy cilia at the top of each cell as observed in the second figure. Cilia normally beat in the direction of the mouth. They are responsible for keeping the airways free of fine dust and germs. Tobacco smoke paralyzes the cilia and prevents this normal housekeeping function [7]. Tobacco smoke also damages the cells and causes a continuing repair process to occur. Figure1.4 shows lung cancer image. Lung cancers can be found by screening, but most lung cancers are found because they are causing problems. If you are having signs or symptoms of lung cancer, then your doctor, who will examine you and order some tests. The actual diagnosis is of lung cancer is made by looking at a sample of lung cells under a microscope. The size of masses range from 3 to 20 cm, with most tumors detected preoperatively either by clinical examination or imaging [6]. In this there are two major hurdles and they are first cancer is hard to detect at initial stage and the second is that there are some other lung diseases which are having similar symptoms of cancer, hence conclusion is difficult [4]. Hence it is necessary to also understand the details of classifications. Next step is the Classification of lung cancer into different stages.

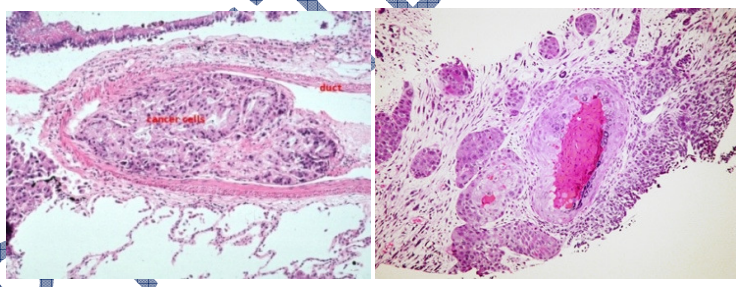


**Figure 1.4 Cancerous lungs under microscopy**

**LUNG CANCER CLASSIFICATION**

Lung cancer staging depends mainly on three things:

- The size of the tumor
- How much the tumor has invaded nearby normal tissues (such as the chest wall), and
- Whether lung cancer cells have spread to lymph nodes or other parts of the body

There are normally four stages of lung cancer. Stage I, stage II, stage III and stage IV. Although in medical term it is consider as stage IA, stage IB, stage IIA, stage IIB, stage IIIA, stage IIIB& stage IV. The stages with the size of tumor can be identified from figure2.1, which helps physician to take decision regarding, which imaging technique to follow.

- Stage I: Area is small and is confined to lung. Treatment, surgery is enough if detected
- Stage II: Area is small and it includes lung and lymph nodes. Treatment, Chemotherapy, surgery or radiation therapy or combination of all.
- Stage III & stage IV: Area is larger and now the cancer has also spread to other parts of body. Treatment, Chemotherapy and radiation and sometimes combination of both.

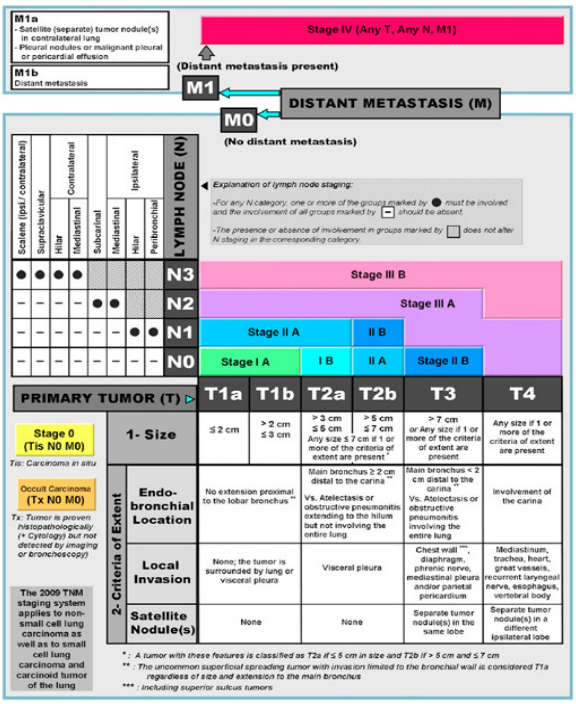


**Figure 2.1Details of lung cancer stages and tumor size [10]**

This paper is not definitely learning about types of lung cancer but highlighting the importance and advantages of the images of Lungs taken through electron microscopy. The advantage of the electron microscopy images is that low as well as high image magnification is easily possible that will help the researchers to get the details of the disease. These images are far more useful for the physicians as well researchers as compared to other medical imaging techniques.

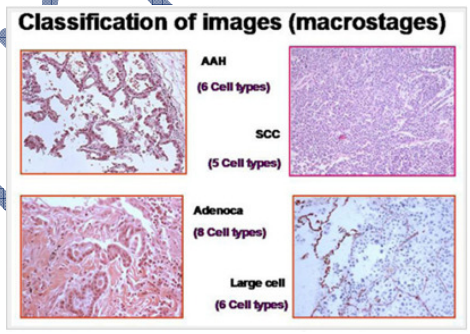


**Figure 2.2 Example of cell types in histological images of lung diseases [10]**

The micro stage classification of lung cancer can be also helpful to go for diseases analyses which can be seen from figure 2.2, which explains cell types in histological images of lung diseases that is AAH (atypical adenomatoid hyperplasia),SSC(small cell anaplystic carcinoma)[3],Adenocarcinoma and large cell anaplystic carcinoma(large cell) used for entropy calculations.

## CONCLUSIONS

Although this overview is not big enough to conclude anything regarding the complete analysis of lung cancer detection and stage classifications, but definitely will be useful for the researchers to use intellectual algorithms to find the region of interest on microscopy lung images. Low and high magnification view of image can be taken, which makes it special. Still detecting cancer at initial stages is a critical task for all the medical experts. We can say through this review that microscopy images will play an important role in medical field in coming years.

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