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### INTRODUCTION

Lung cancer is a disease in which pulmonary cell growth is uncontrolled. The symptoms of lung cancer usually take years to occur and often occur when the cancer is already at an advanced stage, accordingly early screening is recommended for subjects at high risk of lung cancer. If screening results indicates something suspicious, such as an unidentified nodule in the lung, doctors will need to perform a biopsy procedure.

Fine needle aspiration biopsy, also known as standard biopsy method, is a simple biopsy technique which involves inserting a special needle into the human body to take samples from the suspected target. Position and elevation angle are highly significant in this technique. Open biopsy can be considered as a last resort because this biopsy is basically akin to a mini surgery. The physician will open the suspected region and take a sample from there [1,3].

### IMAGE GUIDED BIOPSY

#### Image Guided Biopsy System

Biopsy is an invasive procedure and there is a lot of risk involved as with all other invasive procedures. Various techniques are used to minimize the risk. Image guided biopsy is a biopsy procedure guided by the imaging system such as CT, fluoroscopy, or ultrasound. In the imaging of lung

cancer, the image-guided system is often used for minimally invasive staging, such as image-guided transthoracic tissue extraction, thoracoscopic diagnosis and staging, and nodal evaluations. This technology provides a more precise pathological staging for guiding surgical interventions, multimodal treatment approaches, and sequencing systemic treatment. Numerous imaging methods, e.g. X-rays, CT, and Magnetic Resonance Imaging (MRI), Ultrasound, Positron Emission Tomography (PET) and others are used in the treatment of lung cancer. The choice of the suitable imaging method depends on the type of abnormality and procedure. However, the intrinsic restriction of lung cancer imaging is that it only allows to visualize and measure abnormal areas. Malignancy can only be confirmed by biopsy. Biopsy is recommended for pulmonary nodules larger than 8 mm [4].

### BRONCHOSCOPY BASED METHOD

#### Procedure

Bronchoscopy is a procedure used to visualize the airways of the lungs, called bronchi and bronchioles. Airways transfer air through the trachea or weasand to the lungs. If the patient uses a breathing tube, the bronchoscope can be passed from the tube into the airways. The bronchoscope has a small and light camera which allows the phy-

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**Intrapulmonary bleeding** The risk of bleeding around the lesion or needle tract during biopsy is 5-17%, while the risk of hemoptysis is 1.25-5%. The risk increases especially in lesions deeper than 2 cm and if incision needles are used [27]. When cough and hemoptysis occur, the procedure should be terminated as early as possible, and the patient should be placed on its side with the needle entry pointing down to prevent aspiration and the spread of bleeding. The incidence of hemothorax is about 1.5% and is most commonly caused by intercostal and internal mammarian artery injury[19].

**Air Embolism** is rare (0.02-1.8%), but it might be a fatal complication if aspirated air embolism causes emboli in the coronary or cerebral arteries. It is associated with bronchial-venous or alveolar-venous fistula formation due to needle or with direct air aspiration into the pulmonary vein. In case of emboli, it is recommended to take the patient to left decubitus and Trendelenburg position and give 100% oxygen and prefer intravenous heparin treatment .

**Malignant seeding from the needle tract** The malignant seeding incidence for mesothelioma and other malignant pleural tumors is reported to be high (4%) for needle biopsy. Albeit rare, post-thymoma cases are also reported [20].

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