LUNG CANCER

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Abstract: Lung cancer is one of the most common and deadly malignancies worldwide, representing a significant public health challenge. The disease is characterized by uncontrolled growth of abnormal cells in the lung tissues, leading to impaired respiratory function and systemic complications. Early diagnosis is often difficult due to the asymptomatic nature of initial stages, which contributes to poor prognosis. This article reviews the epidemiology, etiology, pathogenesis, clinical manifestations, diagnostic methods, treatment approaches, and preventive strategies for lung cancer, emphasizing the importance of early detection and comprehensive management.

Keywords: Lung cancer, oncology, diagnosis, treatment, prevention, risk factors, respiratory system.

Lung cancer remains a leading cause of cancer-related mortality worldwide. Despite advances in medical technologies, the disease is frequently diagnosed at an advanced stage due to subtle early symptoms. Risk factors such as smoking, environmental pollution, occupational exposures, and genetic predisposition play a crucial role in the development of lung cancer. Effective management requires an integrated approach that includes early detection, precise diagnostic methods, personalized treatment plans, and preventive measures. This study aims to provide a comprehensive overview of lung cancer, highlighting current challenges and modern strategies in diagnosis and therapy.

Lung cancer is among the most common and deadly malignancies globally. Its prevalence varies across regions due to differences in smoking habits, air quality, occupational exposures, and genetic predisposition. Tobacco smoking remains the leading risk factor, accounting for the majority of cases. Additional risks include prolonged exposure to air pollution, industrial chemicals such as asbestos and radon, chronic respiratory diseases, and family history of cancer. Understanding these factors is crucial for early detection and prevention strategies.

The development of lung cancer is driven by genetic mutations and cellular dysfunction. Mutations in oncogenes and tumor suppressor genes disrupt the normal balance of cell proliferation and apoptosis, resulting in uncontrolled growth of lung epithelial cells. In early stages, tumor cells remain localized, but they can invade surrounding tissues, lymph nodes, and distant organs as the disease progresses. Key

molecular pathways, including EGFR, KRAS, and ALK, are involved in tumor growth and serve as important targets for modern therapies.

Early-stage lung cancer often produces no noticeable symptoms, which complicates timely diagnosis. As the disease advances, patients may experience persistent cough, chest pain, shortness of breath, hemoptysis, and unintended weight loss. Fatigue and recurrent respiratory infections are also common. In some cases, lung cancer may cause paraneoplastic syndromes, resulting in hormonal or neurological disturbances unrelated to direct tumor invasion.

Accurate diagnosis requires a comprehensive approach combining imaging, laboratory tests, and tissue analysis. Chest X-rays and computed tomography (CT) scans help detect and stage tumors, while positron emission tomography (PET) can identify metastases. Bronchoscopy with biopsy remains the gold standard for obtaining tissue samples. Laboratory tests, including tumor markers and molecular profiling, support diagnosis and guide treatment planning. Early screening of high-risk populations significantly improves survival rates.Treatment strategies depend on tumor type, stage, and molecular characteristics. Surgical resection is preferred for localized tumors and early-stage disease. Chemotherapy and radiotherapy are employed for advanced or inoperable tumors. Targeted therapies act on specific genetic mutations, such as EGFR inhibitors, while immunotherapy enhances the patient's immune system to recognize and destroy cancer cells. Personalized treatment plans combining these methods have improved outcomes and quality of life for patients.Effective prevention focuses on minimizing risk factors and promoting healthy lifestyle choices. Smoking cessation, reducing exposure to environmental and occupational carcinogens, and maintaining overall health are essential. Screening programs, particularly low-dose CT scans for high-risk individuals, enable early detection of lung cancer. Public awareness campaigns about symptoms and risk factors further support timely diagnosis and intervention.

Conclusion.

Lung cancer remains a major global health challenge due to its high prevalence and often late diagnosis. The disease develops as a result of complex interactions between genetic, environmental, and lifestyle factors, with tobacco smoking being the leading cause. Early-stage lung cancer is frequently asymptomatic, which emphasizes the importance of screening and early detection, especially among high-risk populations.Advances in diagnostic techniques, including imaging, endoscopic procedures, and molecular testing, have significantly improved the ability to accurately detect and stage the disease. Treatment strategies, ranging from surgery and chemoradiotherapy to targeted and immunotherapy, should be tailored to each patient's tumor type, stage, and molecular profile.Preventive measures, including lifestyle modification, reduction of environmental exposures, and public education, play a crucial role in reducing incidence and improving outcomes. A comprehensive

approach combining early diagnosis, effective treatment, and prevention is essential to enhance survival rates and quality of life for patients with lung cancer.

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