Genetic Biomarkers

Implications of increased understanding and identification in lung cancer management

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BACKGROUND: In the management of lung cancer, molecular profiling of the tumor is pivotal to defining a personalized treatment plan and is recommended for each patient.

OBJECTIVES: The purpose of this article is to provide an update on genomic testing in lung cancer and the associated targeted treatment options. In addition, emerging biomarkers and mechanisms of resistance are discussed.

METHODS: A comprehensive review of the CINAHL®, MEDLINE®, and PubMed® databases was performed.

FINDINGS: Molecular tumor profiling has advanced treatment options for patients diagnosed with lung cancer. Knowledge about pathologic variants and inhibitory pathways have led to the development of targeted treatments for lung cancer. Based on a solid understanding of molecular biomarkers, testing protocols, testing results, and how biomarkers affect treatment decisions, nurses can best educate and support patients and family members as clinical care incorporates molecular profiling.

KEYWORDS
lung cancer; biomarkers; molecular tests; personalized medicine; genomics

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ALTHOUGH THE LUNG CANCER DEATH RATE HAS DECLINED in the United States by about 50% in men and 25% in women since 1990, lung cancer remains the leading cause of cancer death and ranks second in the incidence of new cancers (American Cancer Society, 2020). From 2009 through 2015, the five-year relative survival rate was 19%. Cigarette smoking remains the most significant risk factor, with about 80% of lung cancer deaths caused by smoking. However, the incidence of lung cancer in never-smokers is rising. Radon gas is the second leading cause, followed by various other risk factors, including secondhand smoke, asbestos, air pollution, radiation, and occupational exposures. Unlike malignancies such as breast and colon cancer, germline (hereditary) genetic predisposition plays very little role in the development of lung cancer.

In 2020, an estimated 135,720 people will die from the disease in the United States (Siegel et al., 2020). Fortunately, treatment advances have been encouraging. These advances are largely attributable to the considerable progress made in identifying driver pathogenic variants. In addition, insight into the role of immune-mediated therapies in advanced lung cancer has led to new therapy options. Identifying molecular alterations is key to prescribing therapies that can result in significant responses and long periods of disease control. Overall, targeted therapies play a substantial role in the clinical management of non-small cell lung cancer (NSCLC) and have limited application in SCLC (Taniguchi et al., 2020).

Unfortunately, the incidence of tumor genomic testing remains low, particularly in community practice. Gutierrez et al. (2017) performed a retrospective review of genomic testing patterns in patients with NSCLC treated by 89 oncologists in the eastern and northeastern United States. Of the 59% of patients meeting the recommendations for testing (n = 479), only 8% (n = 63) underwent comprehensive molecular profiling. Educating clinicians about the importance of testing for gene alterations when developing a treatment plan for patients is key in improving the use of genomic testing.

Including the latest evidence in routine treatment decision making is important to ensuring that the best care is being delivered. To this end, oncology nurses strive to integrate evidence-based practice and research into clinical care and operational processes. This article will provide education for