Targeting the mTOR Pathway in Neuroendocrine Tumors

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Neuroendocrine tumors (NETs) are rare, generally indolent tumors that are lethal in the metastatic setting. Treatment options to control tumor growth are limited. In clinical trials, investigational oral mammalian target of rapamycin (mTOR) inhibitors have shown activity in patients with metastatic NETs. The purpose of this article is to provide oncology nurses with a background on the mechanism of action of mTOR inhibitors in the setting of NETs. Increased understanding of the role of mTOR in the pathogenesis of NETs has led to the study of mTOR inhibitor investigational agents in NETs. Treatments are evolving and currently focusing on targeted agents such as mTOR inhibitors. Understanding the mechanisms of action of targeted agents is a critical component of nursing knowledge.

Cancer therapy has changed dramatically since the late 1990s. Molecular targeted therapies are providing new treatment options with more favorable toxicity profiles, resulting in improved quality of life. With progress in drug therapy comes a new challenge for oncology nurses: to understand the mechanisms of action of targeted therapies. The purpose of this article is to help nurses better understand intracellular communication and the molecular basis behind mammalian target of rapamycin (mTOR) pathway signaling inhibition in the treatment of neuroendocrine tumors (NETs).

At a Glance

- Neuroendocrine tumors (NETs) are rare tumors characterized by the ability to synthesize and secrete peptides that can cause hormonal syndromes in the metastatic setting. Although pancreatic and carcinoid NETs are rare, data suggest that they are being diagnosed more frequently.
- Traditional cytotoxic agents are of limited efficacy in the treatment of NETs.
- To communicate effectively with their patients, oncology nurses should be knowledgeable about molecular biology and the mechanisms of action of targeted therapies such as mammalian target of rapamycin inhibitors, a relatively new class of agents.

Neuroendocrine Tumors

NETs are rare tumors that originate from neuroendocrine cells dispersed throughout the body (Talamonti, Stuart, & Yao, 2004). Low- to intermediate-grade pancreatic islet cell and carcinoid tumors represent two types of NETs. Characteristics of these tumors are shown in Table 1. One shared characteristic is their ability to synthesize and secrete large amounts of biologically active hormones that may cause systemic hormonal syndromes. Although they are rare and usually slow growing, low-grade NETs represent a therapeutic challenge for oncologists. They often are asymptomatic and may be found incidentally during surgery for other reasons (Robertson, Geiger, & Davis, 2006). When NETs are localized, surgical excision is the mainstay of therapy (Talamonti et al.). In the metastatic setting, they can produce a variety of hormonal syndromes, are generally considered resistant to cytotoxic chemotherapy, and are incurable (Yao, 2007). The goal of metastatic therapy is to alleviate pain and symptoms of hormonal syndromes and to control progressive tumor growth (Talamonti et al.). Somatostatin analogs, which inhibit the release of pancreatic and intestinal hormones, are used for symptom control. The liver is a frequent site of metastatic disease, with more than 50% of patients with NETs developing liver metastases. Eighty percent of patients with advanced liver metastases die within five years of diagnosis (Talamonti et al.).

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