Radiation Safety Guidelines for Radioimmunotherapy With Yttrium 90 Ibritumomab Tiuxetan

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Radioimmunotherapy is a new cancer therapy that combines the cytotoxicity of radiation with the tumor-specific targeting of monoclonal antibodies. Yttrium 90 (Y-90) ibritumomab tiuxetan (Zevalin™, IDEC Pharmaceuticals Corporation, San Diego, CA) is indicated for the treatment of patients with relapsed or refractory low-grade, follicular, or transformed B-cell non-Hodgkin's lymphoma (NHL), including patients with rituximab-refractory follicular NHL. Y-90 ibritumomab tiuxetan requires only universal safety precautions and does not impose undue risks or radiation safety restrictions on patients or healthcare workers. The ibritumomab tiuxetan regimen can be administered safely in an outpatient setting. Nurses should become familiar with the necessary precautions in caring for patients treated with Y-90 ibritumomab tiuxetan, both to educate patients about safety issues and to minimize the risk of radiation exposure to staff and others.

Key Words: radioimmunotherapy, safety

In 2003, approximately 53,400 people in the United States were diagnosed with non-Hodgkin's lymphoma (NHL), making it the sixth most common cancer in the United States (American Cancer Society, 2003). Unlike most other malignancies, the incidence and mortality of NHL are increasing (McKean-Cowdin, Feigelson, Ross, Pike, & Henderson, 2000). Conventional cancer therapies such as chemotherapy and external beam radiation have not proved successful in curing most forms of indolent, low-grade, or follicular forms of NHL. Furthermore, these conventional therapies often are associated with significant toxic effects in patients.

Disseminated disease typically has been treated with chemotherapy, external beam radiotherapy, immunotherapy, or a combination of these three modalities. Chemotherapy has limited efficacy and, often, burdensome toxicity. External beam radiation is not tumor specific, and it delivers the same amount of radiation to healthy organs as it does to tumor sites, thereby limiting the dose of radiation that can be given. Recent advances in radiation therapy, such as those used with conformal radiation and intensity-modulated radiation therapy technology, target tumors with a higher dose of radiation while delivering less radiation exposure to adjacent tissue. However, this technology is not yet widely available or necessarily appropriate for treating disorders such as lymphoma.

As the use of radioimmunotherapy (RIT) becomes more widespread, nursing staff outside traditional radiation oncology or nuclear medicine facilities will need to understand radiation safety issues and practices. Additionally, nursing staff already familiar with conventional radiotherapy treatment modalities will need to become familiar with the new, often less demanding, safety requirements of RIT. This article reviews the basics of radiation safety and discusses the necessary precautions in caring for patients treated with the yttrium 90 (Y-90) ibritumomab tiuxetan RIT regimen (Zevalin™, IDEC Pharmaceuticals Corporation, San Diego, CA).

Radioimmunotherapy

RIT is an approved treatment modality that combines the cytotoxicity of radiation with the specificity of monoclonal antibodies for tumor cell surface antigens (Potamianos, Varvarigou, & Archimandritis, 2000). Nonradiolabeled, or "cold," monoclonal antibody therapy for relapsed indolent NHL has been shown to produce a 48% overall response rate in NHL that has relapsed after treatment with chemotherapy, with the median duration of response of 11.8 months (McLaughlin et al., 1998). Still, the median survival after a diagnosis of follicular NHL remains approximately 8–12 years (Reiser & Diehl, 2002). However, RIT can deliver higher doses of radiation to targeted tumors than to nearby healthy organs (Press et al., 1993; Wiseman et al., 2001). After the delivery of the radionuclide to malignant tissue by the antibody's targeting of the antigen, cancer cells are killed by a combination of the targeted radiation, the biologic effect of the monoclonal antibody, and the crossfire effect of the radiation on nearby tumor cells to which the antibody did not bind (e.g., because of physical inaccessibility, because the tumor cell did

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