Stereotactic radiosurgery (SRS) is a minimally invasive procedure that delivers high-dose radiation in a single fraction to a precisely targeted area in the brain. Its aim is to eradicate the cells in the targeted area with minimal effect on the adjacent normal brain tissue and critical structures. SRS is used for treating benign vascular lesions (e.g., arteriovenous malformations, venous angiomas), primary benign and malignant brain tumors (e.g., gliomas, acoustic neuromas), and brain metastases (Roland & Eston, 2002; Shin et al., 2002; Spiegelmann, Nissim, Menhel, Alezra, & Pfeffer, 2002). With increasing evidence of SRS efficacy, a growing number of facilities are using SRS; therefore, radiation oncology nurses must develop expertise in this area. Oncology nurses working in other settings, such as offices, clinics, and inpatient units, might have to prepare patients to undergo SRS and, therefore, must be knowledgeable about this type of treatment. This article provides an overview of the SRS procedure and describes the nursing role in caring for patients receiving SRS.

Historical Perspective

SRS has been used since the early 1950s, when the first stereotactic instruments were developed by Lars Leksell. Equipment and techniques have evolved over the years, and two approaches for delivering SRS currently are used. The first approach uses a modified linear accelerator (LINAC) that produces four or six megavoltage x-ray beams and is the focus of this article. The second approach is gamma knife SRS, which uses a number of individual cobalt 60 sources. The basic principles of radiobiology, target localization, and treatment planning are similar for both systems, and both are capable of delivering therapy with high precision and reliability.

Clinical Uses in Oncology and Outcomes

SRS most commonly is used to treat brain metastases. The incidence of brain metastases is about 170,000 cases per year, and the median survival time without treatment is one month (Mehta & Tremont-Lukats, 2002). Whole brain radiation therapy (WBRT) has been the conventional treatment for brain metastases and increases median survival to three to six months (Mehta & Tremont-Lukats). With WBRT, symptom relief occurs in 50%–60% of patients and local control is achieved in 35%–40% of patients (Mehta & Tremont-Lukats). However, toxicities associated with WBRT may be significant. About 5% of patients experience progressive dementia, ataxia, urinary incontinence, and cortical atrophy (DeAngelis, Delattre, & Posner, 1989).

SRS and surgical resection provide two approaches to treating patients who have one to three symptomatic brain lesions. Compared to WBRT, SRS increases local control to 75%–90%, increases median survival to 8–10 months, and reduces toxicities, which may improve quality of life (Chang & Adler, 2001; Mehta & Tremont-Lukats, 2002). Surgical resection provides immediate relief of the mass effect on the surrounding normal brain tissues as well as diagnostic information (Larson, Flickinger, & Loeffler, 1993). However, the cost of surgical resection is 1.8 times more than SRS (Boyd & Mehta, 1999). Because it is an invasive procedure, surgical resection has an increased risk of bleeding, tumor seeding, infection, and brain injury.

SRS also may be used in combination with WBRT to treat brain metastases. Patients with a single lesion, with a diagnosis of non-small cell lung or any squamous cell carcinoma, and categorized as recursive partitioning analysis class I (younger than 65, a Karnofsky performance score [KPS] higher than or equal to 90, and without other metastatic disease) have a higher response rate than patients who have multiple metastases (Spiegelmann, Nissim, Menhel, Alezra, & Pfeffer, 2002).