

STEREOTACTIC RADIOSURGERY FOR PRIMARY BRAIN TUMORS

by Gil Lederman

One of the most potentially devastating diseases is a primary brain tumor such as glioblastoma and anaplastic astrocytoma. They are usually diagnosed at the time of a new neurologic event such as seizure or weakness and may be the cause of progressive symptoms.

Since the brain is a delicate structure encased in the bony skull, there is little extra room for tumors. Surgical excision or removal of brain tumors is an invasive procedure that sometimes is associated with morbidity and mortality.

Tumors in the brain are the most common solid tumors of childhood and are the third most common cause of cancer-related death in both young adults and adults between the ages of 15 and 34. The majority of brain tumors however, occur in those over 45 years of age.

There is no known specific cause of gliomas such as astrocytomas or glioblastoma multiforme. There has been some epidemiologic work finding an association with certain workers in diverse occupations.

The symptoms produced by these tumors can be attributed to the increased pressure that occurs within the head and neurologic damage. Headaches are a common symptom felt to be due to brain swelling with compression of adjacent nerves and blood vessels. The headaches are more common in morning than evening hours. Associated may be abdominal symptoms like loss of appetite, nausea and even vomiting. One may have a change in personality, mental function or actual physical function. Based upon the physical location of the brain tumor, the symptoms vary.

There is a great range in the size of tumors at the time of diagnosis.

Tests performed to evaluate brain tumors after a complete medical history and physical include sophisticated CT scans of the head with contrast agents such as iodine to help distinguish normal brain from abnormal tumor. Some brain tumors are not clearly identified by CT scan and may require the nuclear magnetic resonance test - MRI to help define an abnormality. Certain areas of the brain are best evaluated by MRI.

Tumor size and location dictate if surgical resection should be performed. Another approach is stereotactic biopsy. Stereotactic biopsy is performed by computer-guided placement of a small needle into the tumor to sample the tissue. Some physicians and patients are comfortable with the clinical diagnosis and desire not to have surgical intervention and pathologic confirmation. This latter approach always leaves the question of what the actual diagnosis might be.

Steroid medication is used to help reduce the brain swelling and help improve or stabilize the neurologic deficits. Because of a vast array of side effects ranging from high blood pressure, elevation of sugar to thinning of the skin, blood vessels, muscle and bone, steroid use must be prudently and constantly evaluated and re-assessed.

The standard of care for glioblastomas and anaplastic astrocytomas - surgical resection and radiation - is not curative. For that reason, more sophisticated methods of treatment such as stereotactic radiosurgery have been implemented.

Stereotactic radiosurgery using pencil-thin beams of radiation directed from thousands of different angles obliterate tissues deep within the brain. When developed in the early 1950's by the European neurosurgeon, Lars Leksell, the goal was to destroy tissue in the brain. Now with lower

doses of radiation, the goal is to effectively treat arteriovenous malformations, metastatic tumors and a variety of primary tumors within the head.

Standard radiation involves daily treatments for a period of weeks. This compares to stereotactic radiosurgery which is a single dose of radiation is given and to fractionated stereotactic radiotherapy which is a series of sophisticated radiation with the accuracy of radiosurgery.

Recently published data by Loeffler et al, evaluated 37 patients with primary gliomas treated with standard radiation and radiosurgery. Radiosurgery boosted the dose of external beam radiation to the tumor while helping minimize radiation dose and damage to normal tissues.

Patients were generally quite functional at the time of treatment. Twenty three had glioblastoma multiforme and fourteen had anaplastic astrocytoma. Glioblastoma multiforme is considered a more aggressive primary tumor of the brain.

Removal of the tumor was attempted in twenty of the patients. Seventeen only had stereotactic biopsy.

Patients received standard external beam radiation for a total dose of about 6000 rad. Radiosurgery was administered several weeks after the completion of standard treatment. Thirty six of the thirty seven patients were treated with a single isocenter or sphere of radiosurgery.

The radiosurgery dose ranged from 1000 to 2000 rad, although the median was 1200 rad.

Patients were followed for a median of nineteen months. Nine of the thirty seven patients died at the time of analysis. The median survival of patients of glioblastoma multiforme was twenty-six months. The median survival for patients with astrocytoma has not been reached since the majority of people were still alive. Of eleven patients with anaplastic astrocytoma followed for more than one year, all eleven were free of disease progression, according to the authors.