

## **Radiosurgery For Lung Cancer to the Brain**

A variety of studies have confirmed the benefit for radiosurgery treatment of lung cancer to the brain including a recent article by Kim et al was published in Cancer.

Stereotactic radiosurgery is pinpoint precision radiation. It allows beams of radiation from a variety of angles to enter and focus on the tumor. There is some significant dose given to the immediate surrounding brain but overall this is of modest importance.

A recent analysis was made of 71 patients with non-small cell the most common type of lung cancer - that had spread to the brain. Patients were treated between 1988 and 1995 and were eligible for radiosurgery if they had one to four metastases and no tumor larger than 3 centimeters (cms). Of course, it should be noted that using fractionation, more tumors and even larger tumors can be safely treated but that will be a subject of a separate report from our institution.

Median follow-up after radiosurgery was eight months with a maximum of 60 months. The analysis was performed ten months after treatment of the last patient included. Patients ranged in age from 42 to 81 years with a mean of 62. Time from lung cancer diagnosis to brain metastases diagnosis was nine months on average (range from zero to 73 months). Symptoms included seizures, neurologic deficit and headaches while 17 patients had no symptoms. Most patients were in excellent physical condition with a Karnofsky Performance Status (KPS) - a measure of function - of 90%. Thirty-one percent of patients had active disease outside the brain.

Adenocarcinoma was seen in 46% with squamous cell in 22%, large cell in 16.9% and unclassified in 14.3%. Seventy-one patients had whole brain radiation while six did not. Despite whole brain radiation, four patients had new metastases and 27 patients had progression of the treated tumor. Three patients had both - cancer progressing and new metastases. The time to these events were on average nine months after whole brain radiation, with a range of one to 32 months.

Thirty-seven patients received radiation as a boost at the time of whole brain radiation. Ten patients had surgery to remove the tumor and then underwent radiosurgery because the tumor grew back.

About the primary lung cancer, fifty-three percent had removal of the lung cancer, 46% radiation to the lung cancer while 36% had chemotherapy.

Overall 115 tumors were seen in these 77 patients. Scanning was performed every three months for the first year and then four-to-six months thereafter. The median dose to the tumor was 1600 Centigray (cGy) with a range of 1000 to 2250 cGy. Sixty-nine patients underwent one radiosurgery procedure while five underwent two and one underwent three.

Survival was based on the time from first radiosurgery. Median survival of those with neurologic symptoms was eight months. It was more than twice that for patients without neurologic symptoms. If patients had active systemic disease, survival was two months versus twelve months with stable disease systemically. Squamous cell cancers had a less survival trend but did not reach statistical significance. Interestingly enough, the number of brain metastases did not effect survival nor did tumor location.

Patients undergoing surgery followed by radiosurgery lived slightly longer. All the authors pointed out these were larger tumors than those not receiving surgical procedure first. Also, if the lung

cancer could be resected, the patients did live longer than if it was non-resectable. Whether body radiosurgery will make an impact in this regard remains under evaluation here.

It was noted that "The status of systemic disease, the size of the brain tumor, the presence of intracranial tumor necrosis before radiosurgery (reduced central contrast enhancement), and the resection of the primary chest lesion all significantly affected survival."

The most favorable group were the 14 patients with no neurologic symptoms, no systemic disease and tumor less than 2cms who had a median survival of 26 months. Survival was 8 months if one adverse indicator was seen.

Complications of radiosurgery was seen in 12 patients with edema or swelling around the tumor. Usually steroids were given to these patients. Two patients had hemorrhage within the tumor and required surgical intervention. An additional patient also underwent surgery for tumor necrosis. Three patients had resection additionally due to tumor growth.

An appeal of fractionated rather than single fraction is that it appears to be better tolerated by the surrounding brain and requires less need for intervention. Furthermore, larger tumors can be treated because a greater variety of collimator sizes are available.

An important observation is that the implementation of radiosurgery means that the vast majority of patients will not succumb to brain disease. This is likely to maintain neurologic function and in fact, a better quality of life for a longer period of time.

Also noted was that "Radiosurgery is an especially valuable option for patients with surgically inaccessible metastases."

Certainly, radiosurgery plays an important role in those with tumors both in the head and the body. The benefits are likely to be seen for many years to come.