INTRODUCTION:

Metastatic tumors for the Central Nervous System (CNS) start in other organs, e.g., lung, breast or colon, and spread to the brain and spinal cord. In adults, these are more common than primary CNS/brain tumors. Both primary and metastatic brain tumors can readily spread through the brain or spinal cord, destroying and compressing normal brain tissue. Metastatic brain tumors occur at some point in 20 to 40% of persons with cancer and are the most common type of brain tumor. Prognosis is dependent on several factors including the type of tumor, location, response to treatment, an individual’s age, and overall health status.

Surgery, radiation therapy and chemotherapy are the primary modalities used to treat CNS tumors, either alone or in combination. There are many different approaches in delivering radiation therapy to CNS tumors, including fractionated radiation therapy, stereotactic fractionated radiotherapy, stereotactic radiosurgery, brachytherapy, and proton beam irradiation. Fractionated conformal beam irradiation is the most common approach.

Radiation therapy may be delivered following surgical resection, debulking or biopsy procedures. It may also be used to treat recurrences in patients whose initial treatment was surgery alone. The value of radiation therapy lies in its ability to cure some patients, and to prolong disease-free survival for others. Combined modality approaches that include chemotherapy may also contribute to prolonged disease-free survival in pediatric patients with medulloblastoma, germ cell tumors and gliomas.

The dose and fractionation of radiation depends not only on the tumor type, but also in the curative/palliative setting.

INDICATIONS FOR RADIATION THERAPY FOR PATIENTS WITH METASTATIC CENTRAL NERVOUS SYSTEM TUMORS

Metastatic Brain Tumors

- Favorable Risk (stable systemic disease or new diagnosis, pathologically confirmed diagnosis, no resection)
  - Whole Brain Radiation Therapy (WBRT) 2D/3D-CRT – 20-40 Gy (maximum 20 fractions)
  - WBRT 2D/3D-CRT + 3D/IMRT boost
- WBRT 2D/3D-CRT 20-45Gy (maximum 20 fractions) + SRS/SBRT boost (15-24 Gy, maximum 5 fractions)
- Stereotactic Radiosurgery/Stereotactic Body Radiotherapy (SRS/SBRT) alone for lesions ≤4cm, controlled systemic disease, Eastern Cooperative Oncology Group (ECOG) rating of less than 3, 4 or less metastasis prior to procedure (maximum 5 fractions)

- Unfavorable Risk (poor systemic control, no role for chemotherapy, pathologically confirmed diagnosis, no resection)
  - WBRT 2D/3D-CRT – 20-40 Gy (maximum 20 fractions)

**Post Metastasis Resection**

- WBRT 20-40 Gy (20 fractions maximum)
- WBRT + external beam boost
- Stereotactic Radiosurgery/Stereotactic Body Radiotherapy (SRS/SBRT) post metastasis resection (up to 5 fractions)

**Metastatic Spine Tumors**

- 2D/3D-CRT – 15-40 Gy (maximum 15 fractions)
- Dose/fraction dependent on tumor type and performance status
- Stereotactic radiotherapy/IMRT may be appropriate for re-treatment.

**INDICATIONS FOR PROTON BEAM THERAPY:**

- Treatment of metastatic central nervous system tumors in a pediatric patient (less than 21 years of age)

**TREATMENT OPTIONS REQUIRING PHYSICIAN REVIEW:**

**Intensity Modulated Radiation Therapy (IMRT)**

Intensity Modulated Radiation Therapy (IMRT) may be appropriate for limited circumstances in which radiation therapy is indicated and 3D conformal radiation therapy (3D-CRT) techniques cannot adequately deliver the radiation prescription without exceeding normal tissue radiation tolerance, the delivery is anticipated to contribute to potential late toxicity or tumor volume dose heterogeneity is such that unacceptable hot or cold spots are created.

Clinical rationale and documentation for performing IMRT rather than 2D or 3D-CRT treatment planning and delivery will need to:

- Demonstrate how 3D-CRT isodose planning cannot produce a satisfactory treatment plan (as stated above) via the use of patient specific dose volume histograms and isodose plans.
- Provide tissue constraints for both the target and affected critical structures.
Stereotactic Radiosurgery (SRS) or Stereotactic Body Radiation Therapy (SBRT)

- For metastatic brain tumors with unfavorable risk (poor systemic control, no role for chemotherapy, pathologically confirmed diagnosis, no resection), the following requests require review with a physician reviewer:
  - WBRT 2D/3D-CRT + SRS/SBRT boost (15-24 Gy, maximum 1 fractions)
  - WBRT 2D/3D-CRT + fractionated SRS/SBRT boost (up to 5 fractions and limited to symptomatic metastasis not responding to WBRT)

Requests for SRS/SBRT, beyond the indications listed above, require review by a radiation oncologist of documentation supporting medical necessity. For patients with 4 lesions or more SRS may be appropriate in patients with good performance status and low overall tumor volume.”

Proton Beam Radiation Therapy

- Proton Beam Radiation Therapy for central nervous system lesions adjacent to the brain stem, spinal cord, or optic nerve requires physician review by a radiation oncologist. A treatment plan with a comparison to conventional IMRT/SRS may be required.
- Requests for Proton Beam Radiation Therapy beyond the indications listed above require physician review by a radiation oncologist.
REFERENCES


Laws, E.R., Parney, I.F., Huang, W., et al. (2003). Survival following surgery and prognostic factors for recently diagnosed malignant glioma: Data from the Glioma Outcomes


