INTRODUCTION:

Each year approximately 210,000 people in the United States will be diagnosed with a primary or metastatic brain tumor. There are many different types of brain tumors. Because brain tumors are located at the control center for thought, emotion and movement, their effects on an individual's physical and cognitive abilities can be devastating. Prognosis, or expected outcome, is dependent on several factors including the type of tumor, location, response to treatment, an individual's age, and overall health status. The most common CNS tumors are astrocytomas and glioblastomas, followed by meningiomas and a variety of other less common tumors. Metastatic brain tumors start in other organs, e.g., lung, breast or colon, and spread to the brain. In adults, these are more common than primary brain tumors. Both primary and metastatic brain tumors can readily spread through the brain or spinal cord, destroying and compressing normal brain tissue.

Surgery, radiation therapy and chemotherapy are the primary modalities used to treat CNS tumors, either alone or in combination. The first step in brain tumor treatment is usually surgical resection, with two primary goals: (1) removing as much of the tumor as possible while preserving neurological function and (2) establishing a histologic diagnosis. If the tumor cannot be completely removed, subtotal resection, (debunking) can increase the effectiveness of other treatments. Deep-seated tumors of the brain stem, e.g., pontine gliomas, are generally diagnosed and treated based on clinical and imaging evidence.

INDICATIONS FOR RADIATION THERAPY FOR PRIMARY CNS NEOPLASMS:

Gliomas

- Low Grade Tumors – Grade I or II
  - Post-operative/biopsy – 3D-CRT/IMRT (max 30 fx)
- Recurrence – Low Grade
  - 3D-CRT/IMRT – (max 30 fx)
  - Consider reirradiation on select cases. Dose on individual basis
- High Grade Tumors – Grade III or IV
  - Post-operative/biopsy – 3D-CRT/IMRT (max 33 fx)
- Recurrence – High Grade
  - 3D-CRT/IMRT – (max 30 fx)
  - Consider reirradiation on select cases. Dose on individual basis.
Ependymoma – High (Anaplastic) or Low Grade
  - Brain and/or spine 3D-CRT/IMRT (max 33 fx)

Meningiomas
  - Low Grade and High Grade
    - 3D-CRT/IMRT (max 33 fx)
    - SRS/SBRT (max 5 fx)

CNS Lymphoma
  - Complete response to chemotherapy – 3D-CRT (max 20 fx)
  - Less than complete response to chemotherapy
    - Whole Brain – 3D-CRT (max 20 fx) with or without Limited field boost – 3D-CRT/IMRT (max 25 fx)

Medulloblastoma/Supratentorial PNET (adult)
  - Craniospinal radiation with brain primary site boost – 3D-CRT/IMRT (max 31 fx total)

Primary Spinal Cord
  - 3D-CRT/IMRT (max 28 fx)
  - Tumor below conus medullaris 3D-CRT/IMRT (max 33 fx)
  - SRS/SBRT – (max 5 fx)

INDICATIONS FOR RADIATION THERAPY FOR PATIENTS WITH METASTATIC BRAIN TUMORS

Metastatic Brain Tumors
  - Favorable Risk (i.e., 1 to 3 metastases, Stable systemic disease or New Diagnosis, pathologically confirmed diagnosis, no resection)
    - WBRT 2D/3D-CRT – 20-40 Gy (max 20 fx)
    - WBRT 2D/3D-CRT + 3D/IMRT boost
    - WBRT 2D/3D-CRT 20-45Gy (max 20 fx) + SRS boost (15-24 Gy)
    - SRS/SBRT alone for lesions ≤4cm, controlled systemic disease, EOGO less than 3 (max 5 fx)
  - Unfavorable Risk (i.e., Poor systemic control, no role for chemotherapy, 4 or more metastases, pathologically confirmed diagnosis, no resection)
    - WBRT 2D/3D-CRT – 20-40 Gy (max 20 fx)
    - WBRT 2D/3D-CRT + SRS boost (15-24 Gy, max 1 fx)
    - WBRT 2D/3D-CRT + fractionated SRT boost (up to 5 fractions)
Post Metastasis Resection
  • WBRT 20-40 Gy (20 fx max)
  • WBRT + external beam boost
  • Stereotactic Radiosurgery/Stereotactic Body Radiotherapy (SRS/SBRT) post metastasis resection (up to 5 fractions)

Metastatic Spinal Tumors
  • 2D/3D-CRT – 15-40 Gy 20-37.5 Gy (max 15 fx)
  • Dose/fraction dependent on tumor type and performance status
  • Stereotactic radiotherapy/IMRT may be appropriate for re-treatment.

Unless otherwise indicated standard radiation fractionation consists of 1.8 Gy to 2.0 Gy per day

TREATMENT OPTIONS REQUIRING ADDITIONAL CLINICAL REVIEW:

Intensity modulated radiation therapy (IMRT)
If IMRT is not indicated as a standard treatment option, a peer review will be indicated. 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)
If SRS or SBRT is not indicated as a medically necessary treatment option, a peer review will be required. 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
Requests for Proton Beam Radiation Therapy require a peer review with a radiation oncologist. See Proton Beam Guideline.
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


