Whole Brain Radiation Therapy

A diagnosis of brain metastases has to be one of the most scary and disappointing of all potholes on the cancer journey. It is unfortunately common, happening to about 170,000 new patients each year in the US alone, about half of whom have lung cancer. Radiation therapy is the standard treatment and it is very effective. Until recently, radiation therapy was delivered to the whole brain, but now stereotactic radiation therapy, or radiosurgery is often used. Radiosurgery (SRS) is often known by the trade names of the machines used to deliver it: gammaknife or cyberknife. While these names sound really high tech and Star Trek-like, both machines are delivering radiation therapy of the same type (photons) as a regular radiation machine (linear accelerator), just in an incredibly precise and focused manner.

Whole brain radiation therapy (WBRT) is effective and the treatment of choice if there are many brain mets. Using MRI to examine the brain, about 80% of patients have more than one lesion. For patients with only a single brain lesion, SRS is a standard of care. For WBRT, standard dose-fractionation in the US is 3000 cGy in 10 treatments over 2 weeks, with one fraction given each day, 5 days a week. Multiple large studies have shown that this provides disease control in the brain for about half of people at 6 months (for many patients 6 months is longer than their survival, so in reality, more patients have disease control for their remaining lives).

WBRT can be given instead of, or in addition to, SRS. Arguments against WBRT usually focus around risks and toxicities, specifically about neurocognitive decline. The truth is more complicated (always) – when cognitive function is properly tested before WBRT, 90.5% of patients had significant impairment. When the daily fraction size of radiation is not greater than 300 cGy (=3Gy), there appears to be no significant worsening of neurocognitive function after WBRT, and gradual improvement with time thereafter.

Other arguments against WBRT are that it doesn’t improve overall survival and may negatively impact quality of life. Neither of these statements has been validated in clinical trials that were properly designed to examine those questions.

What does this all mean? Well, having tumor in the brain and having chemotherapy is not good for neurocognitive functioning. Radiation isn’t good for neurocognitive functioning either, but if very large daily doses are avoided, it doesn’t tend to worsen anything. The good news is that as the tumors respond, neurocognition improves. If the only place that the tumor is active is in the brain, then WBRT may improve survival, though I say this with great caution given that these were institutional retrospective studies (though that idea is consistent with what we know about small cell lung cancer and the role of WBRT to prevent brain metastases). WBRT should not be vilified and used only as a last resort, but has a valuable role to play in disease control in the brain. (see here for a thorough review of the topic).