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Commentary

The article retrospectively reviews the Barcelona experience treating patients with cavernous sinus meningiomas

using the fractionated stereotactic radiotherapy technique. It is a reasonably large series for this subgroup of patients, and the follow-up is intermediate in length. The authors report a progression-free survival of 93% and improvement of neurologic symptoms in 50% of patients. Two cases of treatment-related morbidity occurred, both of which appeared to be due to radiation injury to the mesial temporal lobe.

These results are consistent with the literature for stereotactic radiotherapy treatment of cavernous sinus meningiomas reported from the Joint Center in Boston, the Mayfield Clinic, and our institutional experience. With modern techniques such as micro-leaf collimation which achieve both high conformality and target dose homogeneity, morbidity should diminish further while simultaneously optimizing the likelihood of improving pretreatment cranial neuropathies arising from tumor invasion of the cavernous sinus. For tumors which abut the optic apparatus, stereotactic radiotherapy should also minimize the risk of radiation-induced optic neuropathies.

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The authors report their initial experience using improved methodologies for delivery of fractionated radiation therapy in the treatment of a surgically difficult tumor, that is, tumors in the region of the cavernous sinus. As noted by the authors, because of the relatively short follow-up, the results should be considered preliminary and add to additional literature emphasizing that patients with such tumors need careful consideration of the therapeutic modalities available to them. These approaches range from benign neglect to surgical partial removal (with a high risk of additional and at least temporary neurologic deficits), stereotactic radiosurgery, and improved methodologies for fractionated radiation therapy using image guidance data. The current report shows an evolutionary concept over time; patients were treated with different technologies and the treatment plans were based on different imaging. In our experience, computed tomography-based planning is inadequate for radiosurgery, and we abandoned its use more than 13 years

ago. The detail of the tumor anatomy and the surrounding brain and vascular anatomy is unsurpassed by magnetic resonance imaging scan, and this should be considered mandatory in the planning process regardless of the technology ultimately selected to treat the patient. There are several continuing fallacious concepts presented in this report. First, the concept that fractionated radiation therapy has some beneficial response for a slow-growth benign tumor in comparison to the radiobiologic effect of concentrated radiation delivered in a single treatment has no experimental or clinical validity. No outcome analysis has shown benefit to this approach in comparable clinical cases. Secondly, fractionation is used not for radiobiologic response of the tumor but to reduce radiobiologic risk to the adjacent normal vascular, cranial nerve, and brain structures. This raises the importance of both conformality (the ability of the technology to conform the dose to the irregular 3D geometry defined by high-resolution imaging) and selectivity (the ability to restrict the dose outside the tumor margin to the adjacent brain structures). When a technology is insufficiently selective (ie, excessive doses are delivered to surrounding normal structures), fractionation must be used. When the technique has high conformality and high selectivity, then radiosurgery (a single surgical procedure wheels in to wheels out) can be used to inactivate such tumors with a 98% probability and a low adverse risk. Current technologies such as gamma knife can treat tumors that are adjacent to the optic apparatus and still restrict the dose to this critical structure. Low conformality and low selectivity require fractionation, hopefully done more accurately using intensity-modulated radiation therapy, image-guided radiation therapy, mask immobilization systems, and others. When there is high conformality but low selectivity, reduced fraction (hypofractionated techniques) are warranted. When technologies permit high conformality of dose delivery and high selectivity (rapid dose falloff outside the target volume), radiosurgery is the appropriate methodology.

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