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Special Article

A Case-based Guide for World Health Organization (WHO) Grade 2 Meningioma Radiosurgery and Radiation Therapy from The Radiosurgery Society

April K. Vassantachart MD [a], Felix Ehret MD [b c d], Eric Chen MD [e], Ritesh Kumar MD [f], Emile Gogineni MD [g], Therese Y. Andraos MD [g], Arjun Sahgal MD [h], Kristin J. Redmond MD [i], Simon S. Lo MD [j], Eric L. Chang MD [k], Jason Sheehan MD [l], Samuel T. Chao MD [m], Grace Gwe-Ya Kim PhD [n], John J. Kresl MD, PhD [o], Michael Schulder MD [p], Joshua D. Palmer MD [q], Iris C. Gibbs MD [r], Antonio Santacroce MD [d s t], Helen A. Shih MD, MS, MPH [u]

[a] Department of Radiation Oncology, City of Hope, Duarte, California

[b] Charité – Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Department of Radiation Oncology, Berlin, Germany

[c] Charité – Universitätsmedizin Berlin, Berlin, Germany; German Cancer Consortium (DKTK), partner site Berlin, and German Cancer Research Center (DKFZ), Heidelberg, Germany

[d] European Radiosurgery Center Munich, Munich, Germany

[e] Department of Radiation Oncology, University Hospitals Seidman Cancer Center, Cleveland, Ohio

[f] Department of Radiation Oncology, Rutgers Cancer Institute of New Jersey, Rutgers University, New Brunswick, New Jersey

[g] Department of Radiation Oncology, The Ohio State University Wexner Medical Center, Columbus, Ohio

[h] Department of Radiation Oncology, University of Toronto, Toronto, Canada

[i] Department of Radiation Oncology and Molecular Oncology, Johns Hopkins University, Baltimore, Maryland

[j] Department of Radiation Oncology, University of Washington, Seattle, Washington

[k] Department of Radiation Oncology, Keck School of Medicine of University of Southern California and Norris Cancer Center, Los Angeles, California

[l] Department of Neurologic Surgery, University of Virginia, Charlottesville, Virginia

[m] Department of Radiation Oncology, Cleveland Clinic, Cleveland, Ohio

[n] Department of Radiation Medicine and Applied Sciences, University of California San Diego, La Jolla, California

[o] Phoenix CyberKnife and Radiation Oncology Center, Phoenix, Arizona

[p] Department of Neurosurgery, Zucker School of Medicine at Hofstra/Northwell, Manhasset, New York

[q] Department of Radiation Oncology, Arthur G. James Cancer Hospital/The Ohio State University, Columbus, Ohio
[r] Department of Radiation Oncology, Stanford Medicine, Stanford, California
[s] Department of Medicine, Faculty of Health, Witten/Herdecke University, Witten, Germany
[t] Department of Neurosurgery, St. Barbara-Klinik Hamm-Heessen, Hamm, Germany
[u] Department of Radiation Oncology, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts

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Purpose

Meningiomas represent the most common primary tumor of the central nervous system. Current treatment options include surgical resection with or without adjuvant radiation therapy (RT), definitive RT, and observation. However, the radiation dose, fractionation, and margins used to treat patients with WHO grade 2 meningiomas, which account for approximately 20% of all meningiomas, are not clearly defined, and deciding on the optimal treatment modality can be challenging owing to the lack of randomized data.

Methods and Materials

In this manuscript, 3 cases of patients with WHO grade 2 meningiomas are presented with descriptions of treatment options after gross total resection, subtotal resection, and previous irradiation. Treatment recommendations were compiled from 9 central nervous system radiation oncology and neurosurgery experts from The Radiosurgery Society, and the consensus of treatment recommendations is reported.

Results

Both conventional and stereotactic RT are treatment options for WHO grade 2 meningiomas. The majority of prospective data in the setting of WHO grade 2 meningiomas involve larger margins. Stereotactic radiosurgery/hypofractionated stereotactic RT are less appropriate in this setting. Conventionally fractionated RT to at least 59.4 Gy is considered standard of care with utilization of preoperative and postoperative imaging to evaluate the extent of disease and possible osseous involvement. After careful discussion, stereotactic radiosurgery/hypofractionated stereotactic RT may play a role for the subset of patients who are unable to tolerate the standard lengthy conventionally fractionated treatment course, for those with prior RT, or for small residual tumors. However, more studies are needed to determine the optimal approach.

Conclusions

This case-based evaluation of the current literature seeks to provide examples for the management of grade 2 meningiomas and give examples of both conventional and stereotactic RT.

Introduction

Meningiomas represent the most common primary tumor of the central nervous system (CNS).[1] Initial diagnosis is often based on radiologic findings. However, histopathologic and, more recently, molecular evaluation provide necessary data to confirm the diagnosis and provide grading based on the 2021 World Health Organization (WHO) classification system.[2] Approximately 20% of meningiomas are classified as grade 2 tumors, with increasing incidence, and are defined by characteristics including a mitotic rate of 4 to 19 per 10 high-powered field (hpf), brain invasion, specific histopathologic subtypes such as atypical, clear cell, and chordoid, and at least 3 of 5 specified histologic atypical features.[2,3] New molecular classifications inform further distinctions, such as the presence of a TERT promoter mutation or homozygous deletion of cyclin-dependent kinase inhibitor 2A/B (CDKN2A/B), which upstage patients to WHO grade 3. Determination of meningioma grade is important, as patients with higher grade tumors may benefit from more aggressive treatment and are at greater risk for tumor recurrence after treatment.[1,2,4,5]

Standard of care management for patients with meningioma includes serial observation, surgical resection with or without adjuvant conventionally fractionated radiation therapy, and definitive radiation therapy, which includes conventionally fractionated radiation therapy, single fraction stereotactic radiosurgery (SRS), and hypofractionated stereotactic radiation therapy (HSRT).[4,6,7] While standard of care radiation therapy in patients with WHO grade 2 meningiomas is conventionally fractionated treatment, SRS has been shown to be safe and effective for those with WHO grade 1 meningiomas and may be considered for a select subset of patients with grade 2 meningiomas.8, 9, 10, 11 Deciding on the optimal therapeutic approach can be challenging owing to the lack of randomized data, and various features that can contribute to recurrence and treatment toxicity include specific pathologic findings such as brain invasion, the molecular tumor profile, the anatomic location of the meningioma, and superimposed comorbid medical conditions. The purpose of this article is to provide case-based examples for the management of WHO grade 2 meningiomas in the context of conventionally fractionated radiation therapy, SRS, and HSRT.

Section snippets

Patient A

Patient A is a 60-year-old woman with a 5.5 cm frontoparietal parasagittal meningioma who

underwent Simpson grade 3 gross total resection (GTR) with pathology showing a WHO grade 2 atypical meningioma with no brain invasion and a mitotic count of 8 per 10 hpf.…

Case/Plan

The recommended treatment for Patient C is described in Table 5 with the plan shown in Figure 3.…

Future Direction

There is a growing body of reported experience of the use of SRS for meningiomas. In the setting of GTR for WHO grade 2 meningiomas, the role of adjuvant conventionally fractionated radiation is currently being studied and will assist in determining the efficacy and toxicities of an adjuvant approach to help guide further studies on the optimal fractionation, margins, and treatment techniques. Additionally, there may be a role for dose escalation to gross disease ranging from 66 to 70 Gy.[35] In…

Conclusion

Both conventional and stereotactic radiation therapy are treatment options for WHO grade 2 meningiomas. The majority of prospective data in the setting of WHO grade 2 meningiomas involve larger margins, for which SRS/HSRT are less appropriate. Conventionally fractionated radiation therapy to at least 59.4 Gy is considered standard of care, with utilization of preoperative and postoperative imaging to evaluate the extent of disease and possible osseous involvement. After careful discussion,…

Disclosures

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