

Radiation-induced meningioma

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Radiation-induced meningioma refers to the development of a meningioma

Radiation therapy, particularly high-dose or repeated exposure to **ionizing radiation**, is a known risk factor for the development of meningiomas. It can occur as a long-term complication of previous radiation treatments, such as radiation therapy for other types of cancers or as a result of exposure to radiation from other sources, such as nuclear accidents.

The latency period between radiation exposure and the development of radiation-induced meningioma can range from several years to decades. The exact mechanisms by which radiation triggers the development of meningiomas are not yet fully understood, but it is believed that radiation-induced DNA damage and genetic mutations play a role.

When radiation-induced meningioma is diagnosed, treatment options may include surgical removal of the tumor, radiation therapy, or a combination of both, depending on the size, location, and characteristics of the tumor. Regular monitoring and follow-up with a healthcare professional are important to detect any potential recurrence or progression of the tumor.

Clinical features

Radiation-induced [meningiomas](#) are characterized by marked changes to the scalp, including alopecia, atrophy, and poor vascularization. Patients with RIMs frequently present with multiple tumors. Compared with SMS, a higher proportion of RIMs are atypical or anaplastic, and recurrence rates are higher ¹⁾.

Radiation-induced meningiomas are the most common radiation-induced neoplasms. They exhibit a distinct aggressive clinical behavior as rapid growth, recurrences, multiplicity, and malignant progression are common features.¹⁻⁴ Atypical histological findings and aberrant cytogenetics are increasingly identified.⁵⁻⁷ Radical resection of aggressive radiation-induced meningiomas is the best treatment option and would offer the best chance for control of the disease. Wide bone and dural margins should be pursued in the resection. Parasellar extension creates significant surgical challenges. Cavernous sinus exploration through the multidirectional axis provided by the cranioorbital zygomatic approach allows radical resection of the tumor, cranial nerve decompression, and carotid artery preservation and control.⁸⁻¹¹ This article describes a cavernous sinus radiation-induced meningioma after radiation for Cushing disease. It demonstrates the details of the extra- and intradural exploration and dissection of the neurovascular structures in the cavernous sinus, with proximal and distal control of the carotid artery. However, even after radical resection, recurrence is a common finding in this malignant behavioral radiation-induced tumor ²⁾.

¹⁾

Umansky F, Shoshan Y, Rosenthal G, Fraifeld S, Spektor S. Radiation-induced meningioma. *Neurosurg Focus*. 2008;24(5):E7. doi: 10.3171/FOC/2008/24/5/E7. PMID: 18447746.

²⁾

Aversa A, Al-Mefty O. Aggressive Radiation-Induced Cavernous Sinus Meningioma: 2-Dimensional Operative Video. *Oper Neurosurg (Hagerstown)*. 2021 Jun 16:opab195. doi: 10.1093/ons/opab195. Epub ahead of print. PMID: 34133742.

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