WHO Grade 3 Meningioma

WHO Grade 3 meningiomas, also known as **anaplastic or malignant meningiomas**, are the most aggressive subtype. They exhibit high mitotic activity, marked anaplasia, and often infiltrate brain or extracranial tissues. These tumors carry a high risk of recurrence, progression, and metastasis.

Definition

A **WHO Grade 3 meningioma** is diagnosed based on one or more of the following:

- **Mitotic index ≥20 mitoses per 10 high-power fields (HPF)**
- **Frankly malignant cytology resembling carcinoma, sarcoma, or melanoma**
- **Histological subtypes classified as Grade 3**:
    1. **Papillary meningioma**
    2. **Rhabdoid meningioma**
    3. **Anaplastic meningioma**

Histopathological Features

- Marked nuclear atypia and pleomorphism
- Extremely high cellularity
- Prominent nucleoli
- Extensive necrosis and brain invasion
- High mitotic count (≥20/10 HPF)
- Architectural disruption (sheet-like growth)

Molecular Features

- Frequent chromosomal losses: 1p, 6q, 14q, 18q
- **CDKN2A/B homozygous deletion** is strongly associated with anaplastic behavior
- DNA methylation profiling may reveal high-risk epigenetic subgroups
- TERT promoter mutations are associated with poor prognosis

Clinical Behavior

- **Highly aggressive**, often with rapid recurrence despite treatment
- May recur within months after surgery
- Potential for **extracranial metastasis** (lungs, liver, bone)
- More frequent in **non-skull-base** locations

Treatment

- **Maximal safe surgical resection** is the first step
- **Adjuvant radiotherapy** is **strongly recommended**, even after gross total resection
- **Chemotherapy** or targeted therapies may be considered in recurrent or refractory cases, though evidence is limited
- Enrollment in clinical trials is often appropriate

Prognosis

- **Poor prognosis**, with 5-year overall survival around **30–50%**
- Recurrence rate approaches **100%** in many series
- Close surveillance with **frequent MRI** (e.g., every 3–6 months) is mandatory
- Survival correlates with:
    1. Extent of resection
    2. Molecular profile (e.g., CDKN2A/B status)
    3. Response to radiotherapy

References

- WHO Classification of Tumours Editorial Board. *WHO Classification of Tumours of the Central Nervous System*, 5th ed. IARC, 2021.
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