Hypofractionation

Definition: Hypofractionation refers to a radiotherapy regimen in which **fewer but larger doses (fractions)** of radiation are delivered compared to conventional schedules. The total dose may be similar or slightly lower, but the treatment is completed in fewer sessions.

Radiobiological Basis

Tumors with a **low α/β ratio** (e.g., prostate cancer, some slow-growing brain tumors like meningiomas) are **more sensitive to higher doses per fraction** and may benefit from hypofractionated regimens.

> ⬇ Low α/β → Better suited for hypofractionation
> ⬆ High α/β → Prefer conventional fractionation

⚙ Technical Requirements

- **Precise image guidance (IGRT)**
- **Accurate immobilization**
- **Advanced treatment planning systems**
- Often uses **IMRT** or **SBRT** platforms

Applications in Neurosurgery

- **Meningiomas** (especially skull base)
- **Brain metastases** (as alternative to single-fraction radiosurgery)
- **Chordomas and spinal lesions**
- Selected cases of **gliomas** and **post-op irradiation**

> Hypofractionation offers **outpatient treatment**, reduced patient burden, and potential cost savings — when properly indicated.

⚠ Limitations

- Risk of **late toxicity** in surrounding critical structures (optic pathways, brainstem)
- Not suitable for **rapidly proliferating tumors**
- Requires **high infrastructure and QA standards**

Related Terms

- ultra_hypofractionation
- stereotactic_body_radiotherapy

- alpha_beta_ratio
- radiobiology
- fractionation_schedule