hypofractionation in lung cancer

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outline

- general facts
- radiotherapy principles by radiobiology perspective
- hypofractionation
    - stereotactic ablative therapy
    - stereotactic ablative therapy & immunetherapy

general facts

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- lung cancer the most common cause of cancer death
- NSCLC most common type
- 17% localized; 22% locally advanced; 57% distant
- comorbidities

radiation therapy in lung cancer

- one of the main treatment modalities
- technological advancements (4DCT, daily image guidance, PET CT) even more accurate and conformal treatments

radiobiology

radiobiology

- macroscopic radiobiological models
  - tumour control probability (TCP)
  - normal tissue complication probability (NTCP)
- extensive knowledge of the dependence of cell killing on
  - total dose
  - fraction size
  - interfraction interval
  - importance of other factors like hypoxic status

5 Rs of RT

the biological factors that influence the response of normal and neoplastic tissues to fractionated radiotherapy

- **R**epair
- **R**eassortment
- **R**eoxygenation
- **R**epopulation
- **R**adiosensitivity

surviving fraction

$$SF = \frac{N_s}{N_o} = \exp\left\{-\alpha d - \beta d^2\right\}$$

- *SF*: Surving Fraction
- N_0: initial number of cells (clonogens)
- *Ns*: mean number of surviving cells clonogens after a radiation dose *d*
- *d:* radiation dose
- *α:* coefficient for unrepairable lethal damages
- *β*: coefficient for repairable sublethal damages

α/β

$\alpha D = \beta D^2 \quad \rightarrow \quad D = \alpha/\beta$

- α/β: the dose that the contribution on cell death from one hit is equal with the contribution on cell death from multiple hits
- α/β: is characteristic for each tumor type and normal tissues
- clinical significance: the lower the α/β the higher radiosensitivity to fraction size