Clinical and Experimental Radiobiology Course

Tutorial 3

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Tutorial 3

- **Lecture 8: Particles in Radiotherapy**
  - ***Dr. Patricia Lindsay***
- **Lecture 9: The Linear-Quadratic Approach to Fractionation**
  - ***Dr. Tim Craig***
- **Lecture 10: Dose-Response Relationships – Therapeutic Ratio**
  - ***Dr. Andrew Hope***

Lecture 8: Particles in Radiotherapy

Physical benefits of Particle therapy compared with photon therapy include:

A. Less ability to conform the dose to the target

B. Less dose deposited proximal and distal to the target due to presence of the Bragg peak

C. More lateral scattering

D. Easier to focus and steer the beam

Lecture 8: Particles in Radiotherapy

Biological benefits of high LET radiation (compared with low LET radiation) include:

A. **High LET radiation is more dependent on oxygenation**

B. **High LET radiation has more cell-cycle dependence**

C. **High LET radiation shows a reduced range of radiation response to different cell types**

D. **High LET radiation causes less complex DNA double strand breaks**

Lecture 8: Particles in Radiotherapy

High LET radiation is beneficial for every clinical treatment site.

A. True

B. False

Reference: L8 slides 23

Lecture 8: Particles in Radiotherapy

Clinical use of Carbon-ion therapy compared with photon therapy:

A. Is cheaper and more readily availability

B. Shows promise for some treatment sites but more evidence is needed

C. Does not require consideration of RBE in treatment planning

D. Provides a potential benefit due only to improved physical dose deposition

Lecture 9: LQ

An α/β ratio in the range 2–5 Gy is typically characteristic of radiation injury in:

A. Spinal cord

B. Skin

C. Bone marrow

D. Testis

Lecture 9: LQ

Smaller doses per fraction:

A. **Reduce the biological effect for any kind of tissue**

B. **Reduce the therapeutic ratio if the tumor α/β is higher than the α/β for the surrounding organs**

C. **Only affect early responding tissues**

D. **Only affect late responding tissues**

Lecture 9: LQ

Discussion:

Can the linear-quadratic model and BED be used to estimate the α/β from two known fractionation schemes?

Lecture 10: Dose Response

The steepness of a dose-response curve can be quantified by:

A. D_{50}

B. α/β

C. γ_{50}

Lecture 10: Dose Response

The normalized dose-response gradient, γ_{50}, is the:

A. **Dose required for 50% response**

B. **Increase in % response for a 1% increase in dose**

C. **Increase in % response for a 1-Gy increase in dose**

Lecture 10: Dose Response

Discussion:

How much treatment efficacy is lost if a patient misses the last day of treatment?

Lecture 10: Dose Response

The therapeutic ratio for a given modification of RT may be quantified as:

A. **The increase in equivalent dose to the tumour minus the increase in equivalent dose to a relevant normal tissue**

B. **The increase in tumour control probability minus the increase in normal-tissue complication probability**

C. **The increase in tumour control probably multiplied by (1-the normal tissue complication probability)**