Treatment planning
principles

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Soon after the discovery of x rays by Roentgen in 1895 and of natural radioactivity by Becquerel in 1896 it became apparent that ionizing radiation was not only useful for diagnosis and treatment of disease but also harmful to human tissues in terms of both somatic and genetic effects.
- **Radiotherapy** is *localized cancer treatment* where a maximum dose shall be delivered to the tumor while the dose to the surrounding normal tissue must be minimized.

  - **Curative and palliative treatments**
  - **Imaging and dose calculation in RT - 2 D versus 3 D**
  - **Justification of technology**
Treatment techniques…

- Dose response curves

- **External beam therapy** vs. **brachytherapy**

  ➔ Different radiation “sources”
Radiation qualities

- Röntgen 150keV
- Co - 60 (Gamma)
- Elektronen 6 MeV
- Elektronen 18 MeV
- Photonen 6 MV
- Photonen 18 MV
- Protonen 185 MeV
ISODOSEN VERTEILUNG

Co - 60  6 MV Photonen  6 MeV Elektronen

Tiefendosisverlauf
Halbschatten
Profile
**IST-STAND IN ÖSTERREICH:**

13 Abteilungen für Strahlentherapie
37 Hochvolttherapiegeräte + 2 Gamma Knife

- **Innsbruck**: 4
- **Feldkirch**: 2
- **Salzburg**: 4
- **Klagenfurt**: 3
- **Linz**: 4
- **Wien**:
  - AKH: 5
  - Lainz: 2
  - WSP: 2
  - SMZO: 1
  - KFJ: 2
- **Krems**: 2
- **Wr. Neustadt**: 3
- **Graz**: 3

IST-STAND IN ÖSTERREICH: 13 Abteilungen für Strahlentherapie, 37 Hochvolttherapiegeräte + 2 Gamma Knife.
The treatment technique itself depends on the underlying basis for treatment planning or technique for patient data acquisition.

QUALITY ASSURANCE throughout all processes in the RT chain
TREATMENT PLANNING

- **External beam radiotherapy:** usually carried out with more than one beam
  
  ➔ Exceptions for single field treatments is therapy utilising conventional X rays and electron beam therapy.

- **Modern RT is carried out with a variety of beam energies and field sizes under one of two setup conventions**
  
  ➔ In an SSD setup, the distance from the source to the surface of the patient is kept constant for all beams,

  ➔ For an SAD setup the center of the target volume is placed at the machine isocenter.

- **Field sizes:** from small circular fields used in radiosurgery through standard rectangular and irregular fields to very large fields used for total body irradiations.
TREATMENT PLANNING

• An optimal dose distribution can only be achieved if different technical therapy options are utilized. The following parameters have an influence on dose distributions:

  ➔ Beam quality (x-rays, high energy photon or electron beams, neutrons, heavy charged particles) and beam energy

  ➔ Beam incidence (single field, multiple fields, rotational therapy, conformal radiotherapy, stereotactic RT, intensity modulated RT)

  ➔ Beam modifiers (wedges, bolus, multileaf collimators, individually shaped blocks, …)

  ➔ Dose modifications (boost, inhomogeneous dose distribution,..)

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