CERN Medical Applications Workshop

Clinical Results and Perspectives

Michael Baumann

Department of Radiation Oncology,
Medical Faculty and University Hospital, TU Dresden

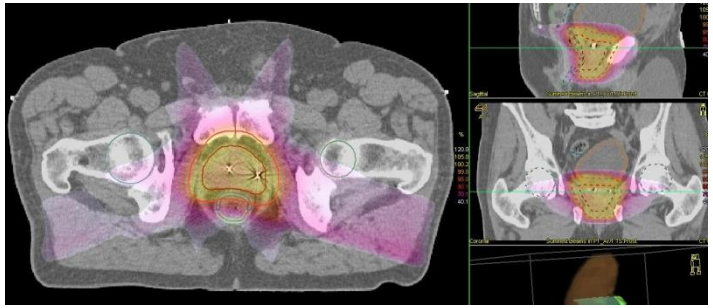
OncoRay – Natl. Center for Radiation Research in Oncology, Dresden

Institute of Radiation Oncology,
HZDR Dresden

German Cancer Consortium (DKTK),
Partnersite Dresden

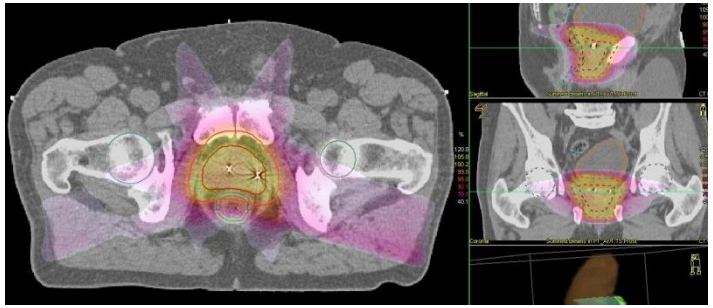
OncoRay National Center for Radiation Research in Oncology Dresden
TECHNISCHE UNIVERSITÄT DRESDEN
HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF
Universitätsklinikum Carl Gustav Carus

Introduction: Today‘s photon therapy



- RT in 50% of cancer patients
- 1:1 curative / palliative
- Demography, multimodality, and increasing awareness of QoL/ function will increase RT utilizition and complexity
- Mainstay of therapy currently is Linac-based photon therapy
- Image guidance (in room imaging), conformal approaches are available in a high number of centers
- Affordable price

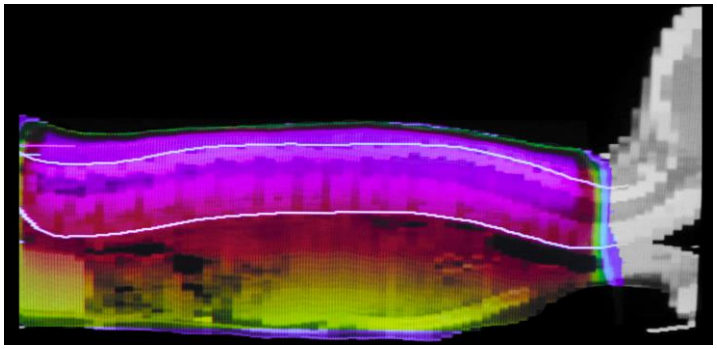
Introduction: Today‘s photon therapy

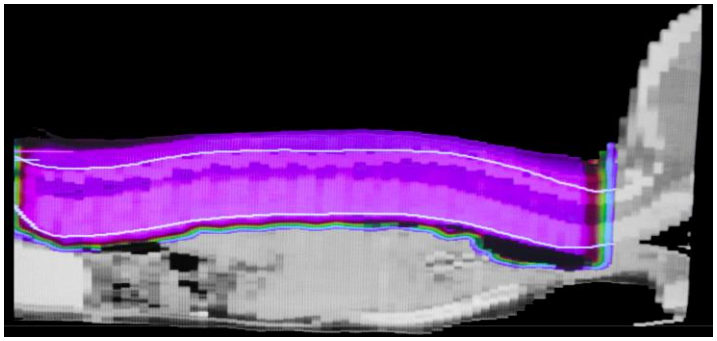


- Appr. 35% locoregional recurrence (biological dose)
- Metastases from uncontrolled primary tumors
- Early, late and very late normal tissue damage (biological dose, volume, critical substructures)

Higher precision may reduce normal tissue damage and potentially allows higher doses to the tumor (RBE effects to be added)

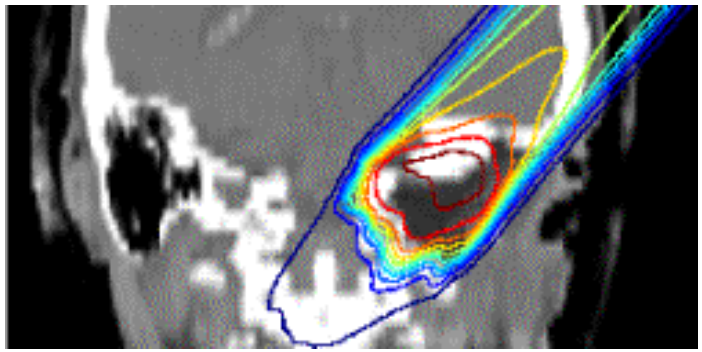
Introduction: Particle therapy





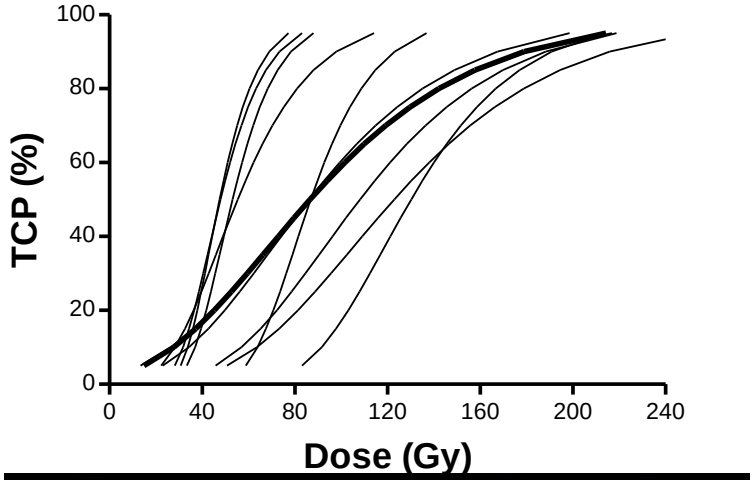
- Accepted in few indications
- Expected to be superior to photon therapy at a clinically relevant level in 10-20% of RT patients (scientific societies)
- This needs to be proven in clinical studies (high level evidence)
- PT more expensive and more demanding than photon therapy

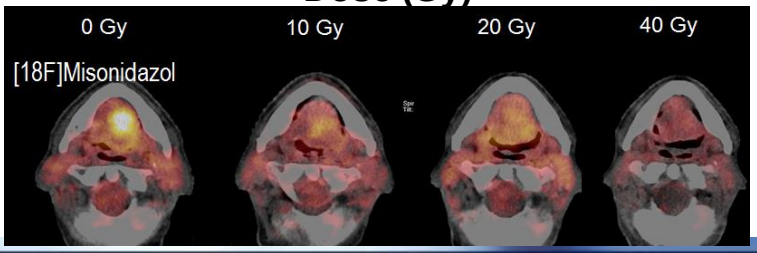
Introduction: Particle therapy
Potential for improvement - equipment



- Compact, less pricy,
  high quality equipment
  (less economic counterarguments,
  better basis for clinical research)
- Same level of image guidance and auxillary equipment as in photon therapy
- Motion control
- Beam position control, in vivo dosimetry (range uncertainty)
- Ultrafast, semiautomated planning for adaptive treatment

Introduction: Particle therapy
Potential for improvement - knowledge





- RBE different beams, tissues, scenarios. Integration in TPS
- Interaction with other anticancer therapy
- Image and non-image biomarkers for selection and stratication (systems analytical [spatially re-soluted] approach)
- Biological adaptation
- …..