The Fast Neutron Therapy Facility in Essen

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Centers for Neutron Therapy

- **Essen:** $d(14)+Be$
  - First patient treated in 1978
  - 769 patients treated
  - Isocentric Gantry, irregular field sizes
  - Annual recruitment about 10 patients
  - 90% adenoidcystic carcinoma
Fast neutron therapy in Essen
Patients over the years

Number of patients

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[Diagram showing the number of patients over the years from 1978 to 2006.]
Fast neutron therapy in Essen

Hospital based facility in close connection with the PET Centre
TCC cyclotron CV28
Circe
Cyclotron Isocentric Neutron Therapy Facility
Radiological Center Essen
Collimator inserts
Liner wedge
50° wedge filter
Depth dose distribution of d(14)+Be neutrons with 11x11cm² collimator
Universitätsklinikum Essen  Strahlenklinik
Neutronenplan Nplan 1.2 vom 22.03.200 11:42:42

Dosismaximum 100%

319° 8x8 0,5 K 30° %

75-80%
65-70%
55-60%
45-50%
35-40%
25-30%
15-20%
5-10%

10.0cm

Maximum = 113,35 % der Dosis im Isozentrum

Abstände Isozentrum-Oberfläche in cm: 9,0568 2,9010 1,7561
Adenoid Cystic Carcinoma: 5 years follow up after neutron irradiation
Fast neutron therapy in Essen

• In 2003 for the first time, the German health care system has paid for fast neutron therapy.
fast neutron therapy
clinical applications accepted and covered by the German health care system

• salivary gland:
  – adenoid cystic carcinoma
    • that are inoperable or where there is residual disease after surgery (including R1)
    • all recurrent not yet irradiated tumors
    • extensive perineural invasion
Adenoid cystic Carcinoma: procedures (1999)

- Recurrent or inoperable or R2 resected and R1 operated adenoidcystic carcinoma

R1  first boost with 6 x 0.8 Gy neutrons followed by 50 Gy photons
R2  first boost with 6 x 0.9 Gy neutrons followed by 50 Gy photons
Recurrent or inoperable or R2 and R1 operated adenoidcystic carcinoma. In case of an extended perineural invasion also after R0 resection

R1  first boost with 3 x 0.8 Gy neutrons followed by 45-50 Gy photons
R2  first boost with 4 x 0.8 Gy neutrons followed by 50 Gy photons

The neutron “boost” is chosen to cover the tumour including safety margins, the photon irradiation is applied as conformal as possible
Treatment of deep seated tumours

Possible because of the isocentric gantry using multiple fields or moving beam therapy
fast neutron therapy in locally advanced prostate carcinoma
Treatment of deep seated tumours

- Collaboration with Orleans:
  - Photon irradiation applied in Essen
  - Neutron irradiation in Orleans
- Accepted by health care system
- Optimal use of the different energies
Collaboration with Orléans

Liposarcoma prior, 6 weeks and 3 years after combined photon/neutron irradiation
Fast neutron therapy in Essen
International collaboration

- Measurement of the spectrum of the beam, dosimetry, mathematical modelling
  - IRSN (F)
  - PTB (D)
  - INEEL (USA)
  - Nice (F)
  - JRC Petten (NL)
- Radiation Biology
  - Orléans (F)
  - Louvain-la-Neuve (B)
- Quality Assurance
  - The Cyclotron Trust (UK)
fast neutron therapy: where is the future?

• combined photon-neutron therapy
• optimized spatial dose distribution
• 3D Treatment planning
• BNCT enhanced fast neutron therapy
• controlled clinical trials
• coordinated and well structured collaboration between the existing centers (stop the stand alone solutions!)
International Workshop on Fast Neutron Therapy in Essen on 14-16 September 2006

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