The European Particle Therapy Network Initiative

Karin Haustermans
Particle therapy in Europe

• Need for clinical evidence to justify this costly technology

• Collaboration between PT centers to generate scientific and clinical evidence
European PT networks

2002 – ENLIGHT
The European Network for Light ion Hadron Therapy
• EU funded
• To coordinate European efforts in hadron therapy research
• Continues to meet annually for a plenary meeting and educational sessions, focusing primarily on basic and translational research

2009 – ULICE
Union of Light Ion Centers in Europe
• 4y EU project
• To respond to the need for greater access to hadron therapy facilities for PT research

2015 – EPTN
European Particle Therapy Network
• To respond to the anticipated increase in the number of particle therapy centers in Europe and the need to cooperate among centers and integrate PT in the framework of existing clinical radiation oncology research networks

2017 – EPTN@ESTRO
EPTN became task force under the Scientific Committee of ESTRO
EPTN annual meetings

May 2015, Brussels
- 28 centers, 2 research organizations (CERN, EORTC)
- Brainstorm session to define roles and tasks EPTN → working parties

May 2016, Brussels
- 27 centers, including CERN & EORTC
- Update activities WPs & way forward

April 2017, Brussels
- EPTN is now a task force of ESTRO
- Use EORTC platform for prospective data registration & clinical PT trials;
- Further integrate activities of ENLIGHT and EPTN
- Collaborate with PTCOG

June 2018, London
- 19 centers
- Progress WPs → papers Green Journal
- Collaborative efforts with PTCOG, ESTRO, ENLIGHT & INSPIRE
- Interact with health care politics, European health care systems and professional societies as an integrated part of radiation oncology
EPTN organisers

Prof. Cai Grau
Radiation oncologist
Aarhus, DK

Prof. Damien Weber
Radiation oncologist
Villigen, CH

Prof. Dietmar Georg
Medical physicist
Vienna, AT
## EPTN working parties

<table>
<thead>
<tr>
<th>WP</th>
<th>Title</th>
<th>Coordinators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clinical</td>
<td>Hans Langendijk <em>(Groningen, The Netherlands)</em> – Leader&lt;br&gt;Roberto Orecchia <em>(Milan, Italy)</em>, Karin Haustermans <em>(Leuven, Belgium)</em>, Daniel Zips <em>(Tübingen, Germany)</em>&lt;br&gt;Jacques Balosso <em>(Grenoble, France)</em>, Esther Troost <em>(Dresden, Germany)</em></td>
</tr>
<tr>
<td>2</td>
<td>Dose assessment, quality assurance, dummy runs, technology inventory</td>
<td>Oliver Jäckel <em>(Heidelberg, Germany)</em>, Sairos Safai <em>(Villigen, Switzerland)</em>, Stefan Menkel <em>(Dresden, Germany)</em></td>
</tr>
<tr>
<td>3</td>
<td>Education</td>
<td>Morten Høyer <em>(Aarhus, Denmark)</em>, Marco Schwarz <em>(Trento, Italy)</em></td>
</tr>
<tr>
<td>4</td>
<td>Image guidance in particle therapy</td>
<td>Aswin Hoffmann <em>(Dresden, Germany)</em>, Alessandra Bolsi <em>(Villigen, Switzerland)</em></td>
</tr>
<tr>
<td>5</td>
<td>Treatment planning systems in particle therapy</td>
<td>Håkan Nyström <em>(Uppsala, Sweden)</em>, Tony Lomax <em>(Villigen, Switzerland)</em></td>
</tr>
<tr>
<td>6</td>
<td>Radiobiology</td>
<td>Manjit Dosanjh <em>(Geneva, Switzerland)</em>, Bleddyn Jones <em>(Oxford, UK)</em>, Jörg Pawelke <em>(Dresden, Germany)</em>, Martin Prutschy <em>(Zurich, Switzerland)</em>, Brita S. Sørensen <em>(Aarhus, Denmark)</em></td>
</tr>
<tr>
<td>7</td>
<td>Health economics</td>
<td>Yolande Lievens <em>(Ghent, Belgium)</em>, Klaus Nagels <em>(Bayreuth, Germany)</em>, Ulrike L. Kliebsch <em>(Villigen, Switzerland)</em></td>
</tr>
</tbody>
</table>
WP1. Clinical

Prospective data registration and clinical trials for particle therapy in Europe

Johannes A. Langendijk\textsuperscript{a,\*}, Roberto Orecchia\textsuperscript{b}, Karin Haustermans\textsuperscript{c}, Daniel Zips\textsuperscript{d}, Jacques Balosso\textsuperscript{e,f,g}, Denis Lacombe\textsuperscript{h}, Yolande Lievens\textsuperscript{i}, Damien C. Weber\textsuperscript{j,k}, Cai Grau\textsuperscript{l}, Esther G.C. Troost\textsuperscript{m,n,o}
WP1. Clinical

• Aim: to enhance evidence-based particle therapy at a European level

• Objectives:
  1. Determine content of prospective data registration programmes
  2. Set up IT infrastructure at European level
  3. Design of clinical PT trials (general guidelines & Expert Committee)
     → The model-based approach
WP1. Clinical

• ParticleCare cohort of E²-RADlлатE
• E²-RADlлатE
  – E² = EORTC + ESTRO
  – Objective:
    Observational prospective multi-cohort
      • Collect real-life data of cancer patients treated with radiotherapy
      • Support radiotherapy research
      • Provide evidence of the role of radiation oncology in a multidisciplinary approach

Overarching infrastructure

• One database
• Prospective data registry
• Providing technical and methodological solutions to efficiently run individual cohorts
E²-RADlatE

Coordinating Committee

OligoCare

ParticleCare

Cohort X

Core E²-RADlatE data items

Specific data items

Specific data items

Specific data items

Specific data items

Specific data items

Specific data items

Specific data items

Specific data items
WP2. Dose assessment & QA, dummy runs, technology inventory

- Six working groups
  1. Quality assurance/equipment survey
  2. Reference dosimetry
     1. Dose-area product (DAP) dosimetry
     2. SOBP-based dosimetry validation
     3. Absolute dosimetry with portable graphite calorimeter
  3. Audits: end-to-end audits with antropomorphic phantoms
  4. Patient specific verifications
  5. Dosimetry tools
  6. Ocular treatment

BiGART 2017 Aarhus
WP3. Education & training

- Work on 3 educational initiatives:
  1. Integrate PT into ESTRO core curriculum, including integrating PT topics into existing ESTRO teaching courses
  2. Establish a masterclass in PT, including continuous training programme (online courses, workshops and homework)
  3. Establish an inter-center staff exchange programme
WP4. Image guidance

EPTN - European Particle Therapy Network

Practice patterns of image guided particle therapy in Europe: A 2016 survey of the European Particle Therapy Network (EPTN)

Alessandra Bolsi, Marta Peroni, Dante Amelio, Alexandru Dasu, Markus Stock, Iuliana Toma-Dasu, Petra Witt Nyström, Aswin Hoffmann
WP4. Image guidance

A large variety in IGPT practices and procedures!

Need for harmonisation of practice parameters and consensus guidelines
WP5. Treatment planning systems

- A collective list of TPS specifications has been published on the ESTRO website as a ‘reference’ document for future proton centres wishing to tender for treatment planning systems.

https://estro.org/about-us/governance-organisation/scientific-council/task-forces/european-particle-therapy-network
WP5. Treatment planning systems

• Planning inter-comparisons for head and neck cases between proton centers
• Questionnaire on policy of patient-specific verifications (to be distributed autumn 2018)
• Working group on CT calibration
  – Survey
  – CT calibration inter-comparison phantom
• Working group on robustness
  – Move towards a recommended standard for evaluating and reporting plan robustness
  – New tasks: LET in TPS, 4D planning, automated planning
WP6. Radiobiology

To form a network of research and therapy facilities in order to coordinate and standardize the radiobiological experiments and to obtain more accurate predictive parameters than in the past.
WP6. Radiobiology

1. Relative biological effectiveness (RBE) in proton beam therapy
2. Interaction of proton radiobiology with radiation physics in current treatment planning
3. Biological effects in proton therapy combined with systemic treatments
4. Testing biological effects of protons in clinical trials
WP7. Health economics

- PT needs to demonstrate its cost-effectiveness and cost-utility balance to allow its positioning in the context of competing modalities.
Building a pan-European perspective

- EPTN: European Particle Therapy Network

<table>
<thead>
<tr>
<th>WP</th>
<th>Title</th>
<th>Coordinators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scoring of normal tissue reactions and tumour response particle/photon radiotherapy, endpoint definitions, outcome database</td>
<td>Hans Langendijk (Groningen, The Netherlands), Mechthild Krause (Dresden, Germany), Roberto Orecchia (Milan, Italy)</td>
</tr>
<tr>
<td>2</td>
<td>Dose assessment, quality assurance, dummy runs, technology inventory</td>
<td>Oliver Jäckel (Heidelberg, Germany), Sarios Safai (Villigen, Switzerland), Stefan Menkel (Dresden, Germany)</td>
</tr>
<tr>
<td>3</td>
<td>Trials inventory (website): Towards joint clinical trials</td>
<td>Karin Haußmann (Leuven, Belgium), Cat Grau (Aarhus, Denmark), Daniel Zips (Tübingen, Germany), Jacques Baloossou (Grenoble, France)</td>
</tr>
<tr>
<td>4</td>
<td>Image guidance in particle therapy</td>
<td>Aswin Hoffmann (Dresden, Germany), Alessandra Bohls (Villigen, Switzerland)</td>
</tr>
<tr>
<td>5</td>
<td>TPS in particle therapy</td>
<td>Hakan Nyström (Uppsala, Sweden), Anton Lomax (Villigen, Switzerland)</td>
</tr>
<tr>
<td>6</td>
<td>Radiobiology, RBE</td>
<td>Manjit Dosanjh (Geneva, Switzerland), Eddyn Jones (Oxford, U.K.), Jörg Pawelke (Dresden, Germany), Jan Alsner (Aarhus, Denmark), Martin Prutschi (Zürich, Switzerland)</td>
</tr>
<tr>
<td>7</td>
<td>Health Economy</td>
<td>Yolande Lievens (Ghent, Belgium), Klaus Nagels (Brussels, Germany)</td>
</tr>
</tbody>
</table>

European Particle Therapy Network participants at 18 May 2016 meeting in Brussels