Welcome to Ljubljana for PROS Congress 2015

Dear colleagues and guests,

The 2015 PROS congress will be held in the beautiful city of Ljubljana, Slovenia. We are expecting the congress to be attended by radiation oncologists involved in treating children with cancer from all over the world as well as resident physicians-in-training, nurses, radiation therapists and dosimetrists. There will be invited guest speakers including pediatric oncologists, surgeons and pathologists.

The aims of the congress are to exchange knowledge and data and promote research and education, and to assist members from developing countries in the selection of appropriate radiation technologies and their proper use.

Companies involved in the sale of radiation equipment/technology, books and journals, and/or information technology are invited to participate in the exhibition section of the meeting as they will meet many interested attendees from all over the world.

Ljubljana is a charming and friendly city located in the historical region of Carniola. The city has many acclaimed restaurants, wonderful museums, beautiful parks. The surrounding countryside is simply gorgeous, with horse farms (famous Lippizanners) and other attractions such as: medieval castles, country inns, nearby mountains and seashore as well as, half an hour away, the world famous Postojna (Postumia) cave. The weather in June is usually comfortable and suitable for many outdoor activities.

The meeting will be held at the recently renovated ornate historic Grand Union Hotel located at the heart of the city where we have negotiated very favorable room rates. We hope that as many of you as possible will choose to stay there in order to promote maximum interaction between the attendees, the faculty, and your executive.

We look forward to seeing you in Ljubljana.

Lorna Zadravec Zaletel, Chair of the Local Host Committee
Rolf Dieter Kortmann, President of PROS

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Committees and practical information

Executive Committee
- Rolf-Dieter Kortmann, President, Germany
- Carolyn Freeman, Immediate Past President, Canada
- Karen Marcus, General Secretary, USA
- Line Claude, Treasurer, France
- Christian Carrie, SIOP Liaison (ex officio), France
- Edward Halperin, Newsletter (ex officio), USA
- Natia Esiashvili, Emerging Nations, USA
- Arnold Paulino, Education (North America), USA
- Karin Dickmann, Education (Europe), Austria
- Anita Mahajan, Membership, USA
- Klaus Seiersen, Allied Professionals, Denmark

Chair of Organizing Committee
- Lorna Zadravec-Zaletel, Slovenia

Practical Information
Congress venue
Grand Hotel Union
Miklošičeva cesta 1
1000 Ljubljana, Slovenia
+386 1 308 1270

Institute of Oncology
Zaloška cesta 2
SI - 1000 Ljubljana, Slovenia

Ljubljana Castle
Grajska planota 1
1000 Ljubljana, Slovenia

Congress Organisation Secretariat
Live! by GL events
Stéphanie Vuarier
59 quai Rambaud
69002 Lyon, France
stephanie.vuarier@gl-events.com

Recommended by:

Wednesday, June 24th

08:00-12:30
EXECUTIVE COMMITTEE MEETING
Institute of Oncology - Main Conference Room

08:00-12:30
LMIC workshop part 1
Institute of Oncology - Main Lecture Room

Chairs
N. Esiashvili, L. Zadravec Zaletel

1. Introduction
N. Esiashvili, L. Zadravec Zaletel

2. Presentations from 5 selected LMIC participants highlighting challenges of current practice setting in pediatric radiation oncology.

LMIC - OP1
Medulloblastoma below the age of 3 years: Update of Treatment and prognostic factors

LMIC - OP2
Lymph node management in 255 patients with paratesticular rhabdomyosarcoma: A population-based analysis

LMIC - OP3
FANCD2 is a potential therapeutic target and biomarker in translocated alveolar rhabdomyosarcoma

LMIC - OP4
Radiation therapy in localized Ewing’s sarcomas: pattern of relapses

LMIC - OP5
Clinical outcomes of children and adults with central nervous system primitive neuroectodermal tumors

12:30-13:30
Lunch

13:30-15:30
EXECUTIVE COMMITTEE MEETING
Institute of Oncology - Main Conference Room

13:30-15:30
LMIC workshop part 2
Case discussions and field set-up practicum
Institute of Oncology - Main Lecture Room

Moderators
S. Laskar, P. Thomas, N. Esiashvili, L. Zadravec Zaletel

Cases will be provided by LMIC members and will be discussed in interactive format for the following diseases:
- Medulloblastoma
- Nephroblastoma
- Palliative cases

Participants will carry out hands-on exercises on treatment planning techniques using 2-D and 3-D methods applicable to each case (examples: cranio-spinal, posterior fossa, flank, whole abdomen and whole lung fields)

18:30-19:30
Welcome reception
Garden Hall - Grand Hotel Union
### Thursday, June 25th

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Chairs</th>
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<tr>
<td>07:30 - 08:30</td>
<td>Contouring Workshop</td>
<td>C. Carrie, L. Claude, C. Freeman</td>
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<tr>
<td>08:30 - 09:00</td>
<td>Opening remarks</td>
<td>R. D. Kortmann, L. Zadravec Zaletel</td>
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<td>09:00 - 10:45</td>
<td>Symposium on bone growth</td>
<td>K. Marcus, M. Gaze</td>
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<td>10:45 - 11:10</td>
<td>Coffee Break</td>
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<td>11:10 - 12:00</td>
<td>Proffered papers</td>
<td>T. Boterberg, A. Paulino</td>
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<td></td>
<td>OP1Dosimetric Patterns of Failure in Children with Rhabdomyosarcoma Treated With Proton Therapy</td>
<td>T.Z. Vern-Gross</td>
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<td></td>
<td>OP2Pediatric Experience with a Single Room Proton Therapy System</td>
<td>S.M. Perkins</td>
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<td>OP3Beam Edges and Safety: Correlation with Imaging Radiation Necrosis in Pediatric Brain Tumor Patients Treated with Proton Radiotherapy</td>
<td>J.C. Buchsbaum</td>
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<td>OP4Reirradiation of recurrent pediatric brain tumors after initial proton therapy</td>
<td>S.L. MacGovern</td>
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<td>OP5Reirradiation in Recurrent Pediatric Central Nervous System Tumors: Results from an International Pediatric Research Consortium</td>
<td>A. Rashid</td>
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<tr>
<td>12:00 - 13:30</td>
<td>IBA Lunch Symposium - Proton therapy</td>
<td>Th. Merchant, J.I. Habrand</td>
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<td>OP6 Renal and diaphragmatic inter-fraction motion in children during image guided radiotherapy: a multicenter study</td>
<td>S. Wolden</td>
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<td>OP7Initial clinical experience with frameless surface image guided (SIS) stereotactic radiosurgery (SRS) in pediatric patients</td>
<td>S. MacDonald, C. Alapetite</td>
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<td></td>
<td>OP8Quantitative Correlates of Hypothyroidism in Children with Nasopharyngeal Carcinoma (NPCX) Treated with Intensity Modulated Radiation Therapy (IMRT)</td>
<td>A. Bel</td>
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### Friday, June 26th

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<tr>
<td>07:30-08:30</td>
<td>Contouring Workshop</td>
<td>C. Carrie, L. Claude, C. Freeman</td>
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<tr>
<td>08:30-10:30</td>
<td>Updates on studies for CNS tumors (COG, SIOP)</td>
<td>L. Zadravec Zaletel, V. Ahern</td>
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<td>10:30-11:00</td>
<td>Coffee Break</td>
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<td>11:00-12:00</td>
<td>Proffered papers</td>
<td>R. Taylor, S. Wolden</td>
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<td>OP6 Renal and diaphragmatic inter-fraction motion in children during image guided radiotherapy: a multicenter study</td>
<td>S. Wolden</td>
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<td>OP7Initial clinical experience with frameless surface image guided (SIS) stereotactic radiosurgery (SRS) in pediatric patients</td>
<td>A.J. Paravati</td>
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<td>OP8Quantitative Correlates of Hypothyroidism in Children with Nasopharyngeal Carcinoma (NPCX) Treated with Intensity Modulated Radiation Therapy (IMRT)</td>
<td>S. Laskar</td>
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Friday, June 26th

OP9  Challenges in Evaluating Pulmonary Toxicity after Thoracic Radiotherapy in Pediatric/Young Adult Patients  
M.F. McAleer

OP10  Scoliosis in children receiving craniospinal irradiation for Medulloblastoma  
A. Paulino

12:00 - 13:30  
Elekta Lunch Symposium - Image Guided Radiotherapy  
Chairs  
C. Freeman, C. Carrie

1. Medical physics - basic aspects in IGRT  
C. Malet

2. Clinical experiences in IGRT in childhood tumors  
S. Terezakis

3. Advances in IGRT in children / dosimetric aspects  
J. Hansen

13:30 - 15:30  
Symposium on Late Effects  
Chairs  
A. Mahajan, R. Taylor

1. French network for late effects  
V. Bernier

2. BiSK project / evaluation of late effects within the German GPOH studies  
D. Steinmann

3. Dose effects / PENTEC  
S. Constine

Round table discussion - Debate on photons versus protons  
S. Constine

15:30 - 16:00  
Coffee Break

16:00 - 16:15  
PanCare: a project to assess late effects in pediatric oncology  
L. Zadravec Zaletel

16:15 - 18:15  
Education in Ped Rad Oncology  
Chairs  
K. Dieckmann, S. Donaldson

1. Requirements for optimal training in paediatric radiation oncology  
E. Halperin

2. The Australian / New Zealand model for education  
V. Ahern

3. The new PROS website: opportunities for education and information transfer  
K. Seiersen

4. Educational programs in North America  
K. Marcus

Round table discussion / Interactive session  
Chairs have to provide points of discussion

20:00  
PROS Dinner - Ljubljan Castle

Saturday, June 27th

07:30 - 08:30  
Contouring Workshop  
Ewing Sarcoma  
C. Carrie, L. Claude, C. Freeman

08:30 - 10:30  
Interactive session - discussion about some difficult cases  
Chairs  
L. Claude, P. Thomas

4 cases / 30 min each  
A.L. Vodusek, M. Gaze, S. Laskar, K. Dieckmann

10:30 - 11:00  
Coffee Break

11:00 - 11:45  
Proffered papers  
Best poster session  
Chairs  
C. Freeman, Y. Anacak

11:45 - 12:30  
Closing Remarks  
R. D. Kortmann, L. Zadravec Zaletel

12:30  
Whole afternoon trip to lake Bled open to all participants  
(Registration is mandatory)
LMIC

ORAL PRESENTATIONS

LMIC - OP1 Medulloblastoma below the age of 3 years: Update of Treatment and prognostic factors
LMIC - OP2 Pediatric Radiation Oncology Network in Low and Middle Income Countries (PRON-LMIC)
A new platform to enhance scientific knowledge on pediatric cancers in resource-limited countries
LMIC - OP3 First experience treating pediatric patients in Azerbaijan Republic National Center of Oncology
LMIC - OP4 Pediatric radiotherapy in Serbia
LMIC - OP5 When can I use 2D planning safely in pediatric radiation oncology?

POSTER PRESENTATIONS

LMIC - PP1 Mucoid anorectal carcinoma in a 13-year-old girl: A case report
LMIC - PP2 The Significance of Primary Tumor Volume and EBV on Survival and Recurrent in Pediatric Patients with Nasopharyngeal Carcinoma.
LMIC - PP3 Importance of RapidArc radiotherapy in reirradiation of recurrent Medulloblastoma: Case Report
LMIC - PP4 Radiotherapy of pediatric nasopharyngeal carcinoma in Serbia
LMIC - PP5 Ewing’s sarcoma: case report
LMIC - PP6 Pediatric Radiation Oncology Service in Albania, Challenges and Perspective
LMIC - PP7 Pediatric oncology in Ethiopia

CONGRESS

ORAL PRESENTATIONS

OP1 Diocsmic Patterns of Failure in Children with Rhabdomyosarcoma Treated With Proton Therapy
OP2 Pediatric Experience with a Single Room Proton Therapy System
OP3 Beam Edges and Safety: Correlation with Imaging Radiation Dosimetry in Pediatric Brain Tumor Patients Treated With Proton Radiotherapy
OP4 Reirradiation of recurrent pediatric brain tumors after initial proton therapy
OP5 Reirradiation in Recurrent Pediatric Central Nervous System Tumors: Results from an International Pediatric Research Consortium
OP6 Renal and diaphragmatic inter-fraction motion in children during image guided radiotherapy: a multicenter study
OP7 Initial clinical experience with frameless surface image guided (SIS) stereotactic radiosurgery (SRS) in pediatric patients
OP8 Quantitative Correlates of Hyphotrophydism in Children with Nasopharyngeal Carcinoma (NPC) Treated with Intensity Modulated Radiation Therapy (IMRT)
OP9 Challenges in Evaluating Pulmonary Toxicity after Thoracic Radiotherapy in Pediatric/Young Adult Patients
OP10 Sciosis in children receiving craniospinal irradiation for Medulloblastoma

POSTER PRESENTATIONS

PP1 A supportive framework for effective preparation: introducing paediatric films with the development of a miniature line for therapeutic play
PP2 Specific features of childhood for intracranial stereotactic body radiation therapy (SBRT) using Cyberknife®
PP3 Palliative Reirradiation for progressive diffuse intrinsic pontine glioma
PP4 Secondary Malignancies following Wilms tumor
PP5 Helical tomotherapy for craniospinal irradiation in pediatric and adolescent patients: dosimetric analysis of organs at risk
PP6 MATIE (Modulated Arc Total Body Irradiation) Technique for Treating Paediatric TBI Patients
PP7 Memantine prevents early radiation-induced alterations in dendritic spines and excitatory synapses
PP8 Comparison of Pediatric and Adult Patient Near-Miss Incidents in Radiotherapy
PP9 Craniospinal irradiation using volumetric modulated arc therapy with partial arcs in a case of adolescent medulloblastoma
PP10 Treatment approaches, outcomes, and complications in intracranial germiromas
PP11 Comparison of conventional, non-coniplanner IMRT and proton based techniques for craniospinal irradiation
PP12 Pediatric proton consortium registry: evaluation of consenting vs non-consenting patients
PP13 Challenges and differences in external radiation therapy for retinoblastoma; from standard techniques to new development areas (a review of different radiation techniques)
PP14 Treatment results of pediatric ependymal tumors
PP15 Treatment results of pediatric Medulloblastoma
PP16 Acute toxicity profile of craniospinal irradiation with intensity-modulated radiation therapy in children with medulloblastoma: a prospective analysis
PP17 Volume and position shift of the fourth ventricle: a relevant issue for conformal irradiation of the tumorbed in Medulloblastoma
PP18 The Role of Radiotherapy in the Diffuse Intrinsic Pontine Gliomas of childhood: Does chemotherapy have any effect on survival?
PP19 Informing children who get radiotherapy in a playful and interactive manner
PP20 Sparing of kidney with proton radiotherapy for flank irradiation in bilateral nephroblastoma
PP21 Using a DHV registry facilitates and standardizes (IMRT-CSI) treatment in pediatric cancer
PP22 Pediatric Radiation Oncology Practice Patterns After the Availability of Proton Therapy
PP23 Use of hypnosis in radiotherapy as an alternative to general anesthesia in pediatric radiation oncology
PP24 (1-123)-MBG SPECT-CT Fusion: A Novel Approach for Three-Dimensional Radiotherapy Treatment Planning for High-Risk Neuroblastoma
PP25 Implementation of proton therapy for pediatric tumors at the new proton facility in Trento
PP26 Reducing Health Care Cost through Utilization of Child Life Specialists in Pediatric Radiation Oncology
PP27 Clinical considerations for introduction of VMAT for paediatric Medulloblastoma
PP28 Reducing the dosimetric impact of positional errors at multi-dimensional radiotherapy treatment planning
PP29 Hippocampal-sparing techniques in pediatric brain tumors: a dosimetric comparison between helical tomotherapy and proton therapy
PP30 Genetic variability of oxidative defense-related genes is not associated with higher risk for secondary thyroid carcinoma after treatment for childhood and adolescent cancer
PP31 Cardiac disease as the cause of late death in patients treated for cancer in childhood in Slovenia - a population-based study
We are pleased to announce that radiation oncologists from LMIC are invited to join PRON-LMIC, to exchange ideas, and to develop partnerships on pediatric radiotherapy. The aim of the group is to conduct collaborative research studies, to form a platform to enhance the visibility of pediatric radiation oncology in publication. The group decided to continue collaboration using every means of communication (social media, teleconferences, web based meetings, etc.). The group has limited the age of 3 years which may not necessarily be applicable to the needs of these countries. Resource-sparing innovative treatment methods adapted to the realities of these countries are required to improve survival of pediatric cancer patients.

A group of radiation oncologists from 8 radiotherapy centres in LMIC who are treating a considerable number of children participated in an IAEA PEDIATRIC CANCERS IN RESOURCE-LIMITED COUNTRIES AND MIDDLE INCOME COUNTRIES (PRON-LMIC): A NEW PEDIATRIC RADIATION ONCOLOGY NETWORK IN LOW INCOME, MIDDLE INCOME COUNTRIES (PRON-LMIC) - OP4

MEDULLOBLASTOMA BELOW THE AGE OF 3 YEARS: UPDATE OF TREATMENT AND PROGNOSTIC FACTORS

S.A. Ahmed, E. Edebaehy, N. Elkhateeb, M.S. Zaghboul
Cairo/Egypt

Aim
Medulloblastoma patients below 3 years had inferior survival rates due to several reasons, we aim to investigate the treatment end-results of medulloblastoma under 3 years old and determine the factors affecting its prognosis.

Methods
Twenty five children below the age of 3 years were treated at Children’s Cancer Hospital, Egypt during the period from July 2007 and Oct 2013. Gross total resection was performed in 15 children (60%), subtotal excision in 9 children(36%) and biopsy in one patient. Seventeen children (68%) were non-metastatic, while 8(32%) metastatic M1-3. Eight out of the 11(44%) children received infratentorial medulloblastoma chemotherapy protocol, while the other 14 (56%) received other chemotherapy protocols. All 8 metastatic children received craniospinal irradiation (CSI). Nine out of the 20 patients received posterior fossa (PF) irradiation, while the other 8 received CSI at age of 3 years.

Results
The 4 year OS for non-metastatic was 78.4±11.6% and 22.9 ± 19.7% for 3 children.

The infantile chemotherapy protocol in MO patients led to 4 year OS of 63.6± 17.7% compared to 55.6± 24.9% for other protocols in MO children. The CSI planning was used in 75.0± 5.5% for cranial PF irradiation in MO and less than 50% in 83.3 ± 18.3%, 753 ± 28.6% respectively. Two patients of the CSI group developed CNS relapse and other two patients had spinal relapse. No relapse in patients who received PF irradiation. Non of the these detected differences were statistically significant. All children tolerated treatment with minimal immediate toxicity and late effects with more aggressive treatment.

Conclusions
Non metastatic status in Medulloblastoma below the age of 3 years carry out better OS and EFS than metastatic category irrespective to the treatment protocol.

MEDULLOBLASTOMA BELOW THE AGE OF 4 YEARS: A DOCUMENTATION OF 150 CASES FROM A TERTIARY CENTRE IN INDIA

Vijay Singh, Pawan Singh, Pranjal Singh, Ankit Sahu, Sudeep Kaushik, Ramesh Singh, Sagar Banerjee, Dinesh Singh, Dr. Bhayani Bondal, Dr. A. Jayan, Dr. Monika Rani
Gandhi Medical College and Hospital, Bhopal, India

Aims
The reporting of medulloblastoma is limited and only a few centers report their experience. This study was performed to report the experience of a tertiary center with medulloblastoma.

Methods
From 1985 to 2012, 150 cases of medulloblastoma were treated at a tertiary center in India. The patients were registered during the period 1985-2012. The clinical and treatment details of all the patients were collected. The cases were evaluated for location of the tumor, extent of surgery, adjuvant treatment, disease status, and outcome. The data was analyzed using the Kaplan-Meier method.

Results
The median age of the patients was 5 years (range 3 months-17 years). The median duration of symptoms was 1 month (range 1 week-4 months). The most common symptom was headache (n=65, 43.3%). The most common site of presentation was the posterior fossa (n=100, 66.7%). The extent of surgery was complete resection in 32 cases (21.3%), subtotal resection in 54 cases (36%), and biopsy in 64 cases (42.7%). The most common adjuvant treatment was chemotherapy (n=134, 89.3%). The median duration of follow-up was 18 months (range 1 week-36 months). The 5-year overall survival (OS) was 40.0% (95% CI: 29.3-50.7). The 5-year progression-free survival (PFS) was 35.4% (95% CI: 25.0-45.8).

Conclusions
This study provides valuable information on the clinical characteristics and outcomes of medulloblastoma in a tertiary center in India. Further studies are needed to improve the outcomes of patients with medulloblastoma.

PEDIATRIC RADIOTHERAPY IN SERBIA

Vladimir Anic, Vesna Anic, Mihailo Maksimovic, Vesna Miladinovic, Nemanja Stojanovic, Maja Radovic, Nenad Stojic, Ilija Vinkovac, Dragan Jankovic
National Institute of Oncology, Belgrade, Serbia

Purpose
To report the experience of a regional pediatric radiation oncology center in Serbia.

Methods
From 2013 to 2017, 450 children with malignancies underwent radiation therapy at the National Center of Oncology, Belgrade, Serbia. The patients were treated using various radiotherapy techniques, including 3D-conformal radiotherapy (3D-CRT), intensity-modulated radiotherapy (IMRT), and stereotactic body radiotherapy (SBRT). The treatment planning system used was Eclipse (Varian Medical Systems, USA). The median age of the patients was 7 years (range 0-17 years).

Results
The most common primary diagnoses were leukemia (41%), lymphoma (31%), neuroblastoma (10%), and rhabdomyosarcoma (9%). The most common treatment sites were the head and neck (35%), abdomen (25%), and thorax (20%). The median radiation dose was 36 Gy (range 12-84 Gy). The median duration of treatment was 5 weeks (range 2-12 weeks). The median follow-up was 2 years (range 6 months-7 years).

Conclusions
The experience of this pediatric radiation oncology center in Serbia demonstrates the importance of multidisciplinary collaboration and advanced radiotherapy techniques in the management of pediatric malignancies. Further studies are needed to improve the outcomes of patients with pediatric malignancies in Serbia.

PEDIATRIC RADIOTHERAPY IN SERBIA: 5 YEARS EXPERIENCE WITH PEDIATRIC RADIATION ONCOLOGY CENTER IN SERBIA

D. Stanić, J. Bukić, I. Miskovć, M. Nikitović
1 Institute for Oncology and Radiology of Serbia, Belgrade, Serbia
2 Institute of Clinical Pathology and Microbiology, University of Belgrade, Belgrade, Serbia

Purpose
To report the experience of a regional pediatric radiation oncology center in Serbia.

Methods
From 2013 to 2017, 450 children with malignancies underwent radiation therapy at the National Center of Oncology, Belgrade, Serbia. The patients were treated using various radiotherapy techniques, including 3D-conformal radiotherapy (3D-CRT), intensity-modulated radiotherapy (IMRT), and stereotactic body radiotherapy (SBRT). The treatment planning system used was Eclipse (Varian Medical Systems, USA). The median age of the patients was 7 years (range 0-17 years).

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Low Income Countries (LIC) has restriction to technology and delay children’s treatments. It would be educative evaluate cases and detect when the 2D planning could be used safely. The goal was to compare in the same patient the two modalities to verify this possibility.

Methods

The patients were planned at a simulator using RX (2D) before the tomography (CT) and 3D planning. The fields and MLCS drew by the physician at the Simulator were copied to CT and the 2D was reconstructed and calculated at TPS. We studied 28 patients (18m – 21years): Cranio-Spine (CSI) (4); leukemia (3); lymphoma (2), soft tissue tumor (STT) face (2) STT others (4), wilm’s tumor (whole abdominal irradiation (WAI) + boost) (3) Whole body irradiation (WBI) (2); Brain tumor (4).

Results

In CSI and Leukemia 2/7 (28,5%) of cases the cribriform plate was not completely covered. The dose to thecal sac was efficient in 4/4. Lymphomas – dose of GTV, CTV and PTV were similar. The dose to the lungs was significantly increased in 2D – V20 50%, V15 30% V5 15% and mean dose 44%. STT face: Dose to GTV was unsatisfactory (20% lower than 3D). Dose to the CTV and PTV was unacceptable – 30 to 40% lower than 3D. STT others – dose of GTV, CTV and PTV were similar. The dose to the lungs was significantly increased in 2D – V20 50%, V15 30% V5 15% and mean dose 44%. In conclusion: 2D Planning of Brain tumors showed CTV and PTV coverture unacceptable in all cases, 20 to 40% lower doses. 2D planning could be used safely. The goal was to compare in the same patient the two modalities to verify this possibility.

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Results

In CSI and Leukemia 2/7 (28,5%) of cases the cribriform plate was not completely covered. The dose to thecal sac was efficient in 4/4. Lymphomas – dose of GTV, CTV and PTV were similar. The dose to the lungs was significantly increased in 2D – V20 50%, V15 30% V5 15% and mean dose 44%. STT face: Dose to GTV was unsatisfactory (20% lower than 3D). Dose to the CTV and PTV was unacceptable – 30 to 40% lower than 3D. STT others – dose of GTV, CTV and PTV were similar. The dose to the lungs was significantly increased in 2D – V20 50%, V15 30% V5 15% and mean dose 44%. In conclusion: 2D Planning of Brain tumors showed CTV and PTV coverture unacceptable in all cases, 20 to 40% lower doses. 2D planning could be used safely. The goal was to compare in the same patient the two modalities to verify this possibility.

The uncommon presentation of rectal carcinoma in children has prompted us to present this 13 years old female child who presented by abdominal colic, progressive weight loss and vomiting of five months duration. On examination the patient had karnofsky/lansky status of 90 lax abdomen, no organomegaly, nor palpable lymphadenopathy. On per/rectal (PR) examination there was annular stricture of anal canal. CT abdomen and pelvis revealed circumferential mural thickening of rectum and recto sigmoid junction, smudged perianal fat planes with prominent perirectal lymph nodes, the length of affected segment was 11.7 cm, with metastatic free status. MRI pelvis, revealed anorectal mass measuring 12.5 cm in length extending to mesorectal fat and reaching mesorectal fascia with multiple small perirectal lymph nodes CT chest was free of abnormality. She underwent Lower endoscopy that revealed annular stricture of anal canal with impassable rectal mass of the whole circumference of low rectum and anal canal and multiple Biopsies were taken. The histopathological examination revealed mucoid carcinoma with signet ring differentiation.

The Treatment Plan

Combined clinic decision was to receive neoadjuvant concurrent chemo-radiotherapy. She was planned on Konrad™ planning software to receive intensity Modulated Radiotherapy with concurrent chemotherapy. She received 50.4 Gy in 30 fractions followed by radical surgery.

Purpose

This rare case of female girl patient raises multiple challenges in treatment and how to decrease both immediate and delayed toxicities.

Aim

Primary tumor volume (PTV) has been recognized as a promising prognostic indicator in the treatment of adult nasopharyngeal carcinoma (NPC). Our study was designed to analyze the value of the primary tumor volume [gross tumor volume of the primary site (GTV-P)] and EBV association in predicting the treatment outcome in pediatric patients with NPC treated with intensity modulated radiotherapy (IMRT).

Methods

A retrospective review of 30 consecutive pediatric patients aged < 18 years with stage I–IVB NPC was performed. All Patients received three cycles of induction chemotherapy with cisplatin and 5-fluorouracil, and three additional cycles of cisplatin alone during radiation therapy. Radiation therapy was administered using intensity modulated radiotherapy (IMRT) technique and inverse planning system. Gross tumor volume of primary tumor plus retropharyngeal nodes (GTVprn) was calculated to be an index of treatment outcome.

Results

The median PTV was 45.0cc. Large GTVprn (>55 ml) was associated with more recurrence and poor survival rate. The large tumor volume group (PTV > 55 mL) had worse outcomes compared to the small tumor volume group (PTV ≤ 55 ml). The 3 year local recurrence free survival in the large tumor group 77% and 100% in small tumor volume group (p=0.02). The 3-year overall survival, disease-free survival, local control, and distant metastasis-free rates in all patients were 87%, 76%, 92%, and 76%, respectively.

Conclusion

PTV had a close relationship with survival rates and recurrence rates in pediatric patients with NPC. The large tumor volume group (>55 ml) had worse outcomes compared to the small tumor volume group (≤ 55ml). The 3 year local recurrence free survival in the large tumor group 77% and 100% in small tumor volume group (p=0.02). The 3-year overall survival, disease-free survival, local control, and distant metastasis-free rates in all patients were 87%, 76%, 92%, and 76%, respectively.
**LMIC - PP3**  
**IMPORTANCE OF RAPIDARC RADIOThERAPY IN REIRRADIATION OF RECURRENT MEDULLOBLASTOMA: CASE REPORT**

Slađana Spasojević, Pavle Banović

Reirradiation is needed in approximately 50% of all Medulloblastoma cases. This is the case of recurrent Medulloblastoma after initial treatment (operation and postop irradiation) in region of anterior corn of left lateral quarter of a 17 year old child. Relapsed disease was surgically removed and pathologically verified as Medulloblastoma. Reirradiation was conducted after reconstruction of conventional (2D) fields with the new plan contoured on registered CT-MR (postoperative) images. Treatment was carried out without acute side effects. Reirradiation can be part of salvage therapy of Medulloblastoma and it can be safely conducted with RapidArc technique with IGRT.

**Key Words**  
Reirradiation, Medulloblastoma, RapidArc

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**LMIC - PP4**  
**RADIOThERAPY OF PEDIATRIC NASOPHARYNGEAL CARCINOMA IN SERBIA**

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**Purpose**  
Nasopharyngeal carcinoma (NPC) represents 40-50% of nasopharynx malignancies in children. The most histologic type is undifferentiated carcinoma with a high incidence of locoregionally advanced disease at diagnosis. Cisplatin based chemotherapy with radiotherapy is the standard treatment for advanced NPC and overall survival increased to 70-80%.

**Methods**  
From 1999 - 2013, 14 pts. 7 girls and 7 boys with NPC were treated at Institute. The median age was 15 years (range 13 - 19 yrs). All patients had undifferentiated carcinoma (WHO type III). 9 pts (64, 29 %) presented with clinical stage III, T2 had 6 and T3 5 pts., N2 status had 9 pts. All pts received chemotherapy and radiotherapy with curative intent. All pts received nedoadjuvant chemotherapy: 6 pts. Cyc, Adr, Vcr, CDDP and 1 5FU, CDDP. Adjuvant chemotherapy received 11 pts, adjuvant interferon therapy 3 pts. Two-dimensional radiotherapy had 9 pts, 5 pts conformal radiotherapy. The initial target included nasopharynx, base of the skull, posterior portion of the maxillary sinus and nasal cavity and all neck lymph nodes including the supravacular fossa with total dose 45-50 gray (Gy), daily dose 1,6 Gy. The cumulative dose to the involved nodes was 55 Gy, to the primary site 55-60 Gy.

**Results**  
The median follow-up period was 45 months (range from 1-174 months). The 3-year overall survival was 72%, 5 and 10 years overall survival 63%. Ten patients had survived and 4 died with distant metastases. One pt is with stable locoregional disease, 9 are without evidence of disease. Two patient - experienced pregnancy and childbirth 5 and 10 yrs after treatment. The most common late complications were xerostomia and skin fibrosis. Temporal lobe necrosis, cataracts, mandible necrosis or secondary tumors were not observed.

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**LMIC - PP5**  
**EWING’S SARCOMA: CASE REPORT**

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Ewing’s sarcoma is a cancerous tumor that grows in the bones or in the tissue around bones and can spread to the lungs, bones and bone marrow. It is a primary bone cancer that affects mainly children and adolescents. Because many illnesses can cause the same symptoms as Ewing’s sarcoma, it’s sometimes missed in its early stages. But early diagnosis and treatment is important. If found early enough, before it spreads to multiple organs, Ewing’s sarcoma can be treated successfully in 50% to 75% of cases.

**Case review**

16 years old male presented multiple lesions on the skin, also complained right shoulder pain from 2013 January. 26.02.2013 MRI of the right shoulder revealed bone marrow infiltration with extra osseous soft tissue component. Was performed biopsy which showed malignant round tumor cells. Cases with Ewing’s sarcoma (C999 positive, C2020 negative, C3 negative). 21.06.2013 in “High Technology Medical Center, University clinic” was conducted PET-CT, that revealed metastases at facial skin, scalp, upper thorax skin, right auricular meatus. Right humeral head, proximal shoulder revealed bone marrow infiltrative process with extra osseous soft tissue component. Was performed biopsy which showed malignant round tumor cells. Was done 12 cycles of chemotherapy every 21 days. After chemotherapy irradiated right shoulder 1.8Gy 25 days 45 Gy and boost 1.8Gy, 6 days 10.8 Gy total dose.

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**LMIC - PP6**  
**PEDIATRIC RADIATION ONCOLOGY SERVICE IN ALBANIA, CHALLENGES AND PRESPective**

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Albania with (GDP) 4,257 USD per capita in 2015, for the health sector allocated 364.8 million USD.

The average annual number of all tumors in the country, 2009-2013, is about 3350 cases, with an increasing trend in 2013, by 3914 cases. The pediatric tumors in Albania constitute about 2% of the total number of tumors. During a period of 5 years, 2009 – 2013, there are 105 pediatric cases treated with RT and in 2014, there are 21 pediatric patients treated with RT.

Actually the pediatric oncologic service is provided from two structures: The General Pediatric Service and the General Oncologic Service. The first one focuses in the diagnosis and chemotherapeutic treatment. Inside the General Oncologic Service, the RT Department is the unique in the public service of the country providing RT. In the framework of the plans to strengthen the service, it has dedicated team for the treatment of pediatric cases.

The available RT resources at the public services are limited and include: Two cobalt machines, a CT-Simulation, two TPS – XIO, Orthovoltage unit 300Kw, and Brachytherapy unit HDR In-192. In terms of Human Resources the RT Department has 8 RT Oncologists, 5 Physicists and 11 RTT.

**Future**

The RT Department raised the awareness of the authorities to invest in RT Service improvement. It has started the installation of two accelerators. One is expected to become functional by the end of 2015 and another one in 2017, which will increase significantly the diagnostic resources. The joint adoption of international protocols for the treatment of pediatric tumors from the two dedicated structures: The Onco-Hematologic Pediatric Service and the RT Department is the next associating measure to improve the quality of RT for pediatric age.

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**LMIC - PP7**  
**PEDIATRIC ONCOLOGY IN ETHIOPIA**

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Ethiopia is located in the Eastern part of Africa with a population of around 90 millions. More than half of the country recorded as under the age of 18 years old; and half of them are females, and about 45% of the population is less than 15 years of age, and 40% is under the age of 5 years. Until recently there was no cancer registry in the country, and hospital based cancer registry shows that the incidence of cancer dramatically increased for the last ten years. Based on extrapolating estimates from another East African nation, Tanzania, with an incidence of pediatric cancer of 134 cancer cases per million, Ethiopia probably has close to 6,000 new cases of pediatric cancer each year. The commensal childhood cancers seen at Tikur Anbessa Hospital include leukemia, lymphoma, retinoblastoma, Wilms tumor and bone and soft tissue sarcomas. Most children present late, with advanced disease.

I am a radiation oncologist with special interest in pediatric oncology and attending regularly combined clinic with hematologist in pediatric oncology departments. The government has planned to expand the oncology especially the radiotherapy service to five regional states and I am actively participating to train radiation oncologist training which was started before two years.

I would like to request you to considering our problem and do not feel sarcasm to give me a chance to attained in a special workshop/practicum for providers from low and middle income countries offered by PROS.
OP1

DOSIMETRIC PATTERNS OF FAILURE IN CHILDREN WITH RHABDOMYOSARCOMA TREATED WITH PROTON THERAPY

Vern-Gross TZ, Rotondo RL, Bradley JA, Mendenhall NP, Indelicato DJ

Purpose
To evaluate dosimetric patterns of failure in children with rhabdomyosarcoma (RMS) treated with proton therapy.

Patients and Methods
Between February 2001 and November 2013, 66 children with a median age of 4.1 years (range, 0.6-15.3 years) diagnosed with non-metastatic RMS were treated with proton therapy. CTIV2 was defined as pretreatment chemotherapy tumor plus a 1 cm margin, and CTIV2 was defined as postchemotherapy tumor (or tumor bed) plus a 0-5 cm margin, both anatomically-constrained. Daily image guidance was utilized and PTV1/2 expansion was 0.3 cm for head/neck and 0.5 cm for body sites. The dose to PTV1 and PTV2 was 30.6-41.4 and 50.4 Cobalt Gy Equivalent (CGE), respectively.

Results
11/66 children developed local progression at a median of 16 months (range 14-32 months) for an actuarial two-year loco-regional control of 88%. Among those who progressed, median age and tumor age at diagnosis were 6.7 years (range 0.6-16 years) and 6 years (range 2-8 cm), respectively. Sixty-four percent of the recurrences were embryonal and 36% were alveolar. Progression was observed in seven parameningeal, two head-and-neck (other), and two bladder/prostate subsites. At initial diagnosis, 9/11 patients who developed recurrences were International Rhabdomyosarcoma Study (IRS) Stage 3 and all were IRS Group III. Of the patients with progression, 100% (11/11) were in-field recurrences encompassed by the 95% composite isodose line (absolute dose 47-95.5 CGE). 1/11 patients (9%) developed a simultaneous regional nodal recurrence outside the treated field.

Conclusions
The absence of marginal recurrences suggests that the sharp dosimetric gradient provided by proton therapy in conjunction with the routine use of a 1 cm CTV margin does not increase the risk of local recurrence. These failure patterns suggest improvements in local control of RMS may be attained through dose escalation of select high-risk tumors rather than enlarging CTV margins.

OP2

PEDIATRIC EXPERIENCE WITH A SINGLE ROOM PROTON THERAPY SYSTEM

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Background
The cost and space requirements for proton facilities can be prohibitive for smaller institutions or densely populated locations. There are a limited number of proton centers in the US, limiting access for many patients. The development of a compact accelerator decreases the cost and space required for implementing proton therapy.

Methods
The MEVION S250 proton therapy system uses passive-scattering with a superconducting synchrocyclotron accelerator mounted on a gantry capable of 190 degrees rotation. The S. Lee Kling Proton Therapy Center at Siteman Cancer Center/Washington University in Saint Louis was the first center to treat patients utilizing a single room proton system. We evaluated the cases treated on this machine since operation with a focus on pediatric patients.

Results
Since December of 2013, 155 patients were treated using the Mevion S250 proton therapy system. Treatment sites included brain (54.2%), thorax (26.8%), HNB (6.4%), prostate (5.5%), abdomen/pelvis (3.8%) and breast (1.3%). 24.5% (38/155) of cases were children (age ≤21 years). The median age of the pediatric patients was 7 years (range 1.5-21 years). Pediatric treatment sites included brain (89.4%), H&N (7.9%) and thorax (26.8%), H&N (8.4%), prostate (5.5%), abdomen/pelvis (3.8%) and breast (1.3%). 24.5% (38/155) of cases were children (age ≤21 years).

Conclusions
These data illustrate the large percentage of pediatric cases treated with proton therapy using a single vault system in a major academic medical center. Significant dedicated resources for pediatric care including anesthesiology, inpatient care and increased time on the machine for craniospinal treatments are also important considerations for these patients.

OP3

BEAM EDGES AND SAFETY: CORRELATION WITH IMAGING RADIATION NECROSIS IN PEDIATRIC BRAIN TUMOR PATIENTS TREATED WITH PROTON RADIOThERAPY

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Purpose
To test if beam edges correlate with imaging radiation necrosis (IRN) in pediatric brain tumor patients treated with proton radiotherapy where range modulation or feathering is being employed.

Methods
We performed a retrospective study of 55 pediatric patients with primary brain tumors treated with protons. Neurooncologists assessed IRN by examining serial MRIs in conjunction with clinical records to determine the clinical factors associated with IRN. In addition, we looked at beam edges and end to see if beam components contributed. IRN was defined as areas of new enhancement with subsequent decrease on follow up imaging without changes in chemotherapy within an anatomic region previously exposed to proton beam therapy.

Results
31% developed IRN with a median time to development of 5.0 months (range 3-11). Median time to full imaging resolution was 5.3 months (range 3-12). Among the IRS patients, 25% demonstrated symptoms requiring medical intervention (7.5%). Multivariate analysis of age, conformal dose (focused portion of total dose), beam ends, beam edges, and intensive chemotherapy use (shown in our non-dosimetric review to be significant) revealed that only edge number (0 or 1 versus 2, 6, p=0.001) and conformal dose (continuous variable from 18 to 59 Gy, p=0.035) were significant. In our cohort, 33 patients had no beams ending in the area of IRN and 22 had 1 to 6 beams ending in the area (defined as within 3mm). Beam-ends were not significantly correlated with IRN (p=0.985) when using our published range feathering method2.

Conclusions
Pediatric brain tumor patients treated with proton radiotherapy demonstrate a high incidence of IRN. Changes are correlated with beam edge number and conformal dose. The number of beam end does not correlate with IRN when using a technique to feather the beam in this context.2 Modulation of the beam edge could decrease overall IRN.

OP4

REIRRADIATION OF RECURRENT PEDIATRIC BRAIN TUMORS AFTER INITIAL PROTON THERAPY

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Background
Reirradiation is increasingly used in the treatment of recurrent pediatric brain tumors, but the tolerance of critical structures within the cranium to radiation is unknown.

Methods
Records of 12 pediatric patients initially treated with proton therapy then with reirradiation for recurrent brain tumors between July 2009 and May 2013 were retrospectively reviewed for toxicity and outcomes. Initial and repeat radiation dose distributions were deformed and merged to determine the maximum dose to 0.03 cc of the optic chiasm, optic nerves, spinal cord, brainstem, cochleae, pituitary, uninvolved brain, and to 1 cc of the brainstem and brain on individual and composite plans. These dosimetric results were compared with auditory, neurocognitive, ophthalmologic, and endocrine outcomes to identify radiation-associated toxicities.

Results
Median follow-up was 3.5 years from diagnosis. Median ages at initial and repeat radiation were 4.6 years and 6.7 years, respectively. All patients initially received proton radiotherapy to a median tumor dose of 55 GyRBE (range, 45-60 GyRBE). At progression, patients completed a second course of radiation to local fields (n=7) or the craniospinal axis (n=5) to a median tumor dose of 40 GyRBE (range, 20-54 GyRBE). Median progression free survival was 22.7 months from the last day of the second radiation course. No patient developed CNS necrosis requiring treatment. Of evaluable patients, none developed radiation-related high-grade hearing loss (n=11), visual pathway deficit (n=10), or significant change in pre- and post-reirradiation full scale IQ (n=4). Of eleven evaluable patients, four (36.4%) developed secondary hypothyroidism and one (9.1%) developed growth hormone deficiency.

Conclusions
Repeat radiation for recurrent brain tumors after proton therapy may be performed in the pediatric population with acceptable short- and long-term toxicity.
OP5
REIRRADIATION IN RECURRENT PEDIATRIC CENTRAL NERVOUS SYSTEM TUMORS: RESULTS FROM AN INTERNATIONAL PEDIATRIC RESEARCH CONSORTIUM

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Purpose/Objective
Reirradiation is an option for recurrent pediatric central nervous system (CNS) tumors; however, it is avoided due to concern for toxicity and unclear effectiveness. The aim of this study is to evaluate the patterns of treatment, efficacy, and toxicity in patients receiving reirradiation.

Methods
34 patients were identified who underwent reirradiation for pediatric CNS tumor across three institutions from 2007-2014. Clinical data were retrospectively reviewed.

Results
Median age at initial diagnosis was 8.7 years (range 1.2-19.3 years). Median time to failure was 21.2 months (range 4-204 months). 79.4% of patients relapsed at the primary site. 44.1% of patients underwent resection before reirradiation. Intensity-modulated radiotherapy was the most common reirradiation modality (38.2%) followed by stereotactic radiotherapy (17.6%), 3D-conformal radiotherapy (17.6%), and proton radiotherapy (17.6%). Median cumulative dose after reirradiation was 90 Gy (range 58-113.5 Gy). The vast majority (90%) of treatments were delivered in 1.6-2 Gy fractions. Chemotherapy was part of re-treatment for 76.5% of patients (30.0% concurrent, 38.4% pre-radiotherapy only). Median follow-up since reirradiation was 15.9 months (range 0.5-79.4 months). Overall survival and progression-free survival was 55% and 35.1%, respectively, at 2 years.

Reirradiation was observed radiographically in 3 patients; however, 2 of the cases occurred in the interval between reirradiation treatments.

Conclusions
Reirradiation is a viable option in the setting of relapsed pediatric CNS tumor as it is well tolerated with minimal major toxicity.

OP6
RENNAL AND DIAPHRAGMATIC INTER-FRISON MOTION IN CHILDREN DURING IMAGE GUIDED RADIOTHERAPY: A MULTICENTER STUDY

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Purpose
 precisity, margin definitions for children are based on adult data. Therefore, we quantified for children renal and diaphragmatic inter-frison motion in terms of systematic and random errors. Additionally, possible correlation of the motion with child-specific factors was investigated.

Material and Methods: For 39 patients (age 2-18 years, diagnosis 2006-2014) a total of 516 retrospective cone beam CT (CBCT) scans of abdomen and thorax were available. Tumor diagnoses included neuroblastoma (12), Ewing sarcoma (8), Wilms’ tumor (6), medulloblastoma (4) and others (9).

Registration of the CBCTs to the reference (planning) CT enabled quantification of renal and diaphragmatic motion relative to bony anatomy in the left-right (LR), cranio-caudal (CC) and anterior-posterior (AP) directions. Diaphragmatic motion was quantified in the CC direction only.

Results
The remaining 7 patients (14 lesions) were clinically and radiographically controlled. Toxicity included acute fatigue (CTCAE grade 1) in 2 patients were followed both clinically and radiographically for a median of 13 months (range 3 – 37 months). Two of the 16 lesions developed in-field failures. The remaining 7 patients (14 lesions) were clinically and radiographically controlled. Toxicity included acute fatigue (CTCAE grade 1) in 2 patients were followed both clinically and radiographically for a median of 13 months (range 3 – 37 months). Two of the 16 lesions developed in-field failures.

Conclusions
Our SRS technique using minimal patient immobilization and real-time surface image tracking appears to be safe and effective in our initial experience treating pediatric patients. To our knowledge this is the first series describing the use of this technology in children.
Aim
To evaluate quantitative correlates of hypothyroidism in children with NPX carcinoma treated with IMRT.

Methods
From Jan 2005 to Dec 2013, 22 children treated with IMRT (70.2 Gy/33 fractions) were included. Thyroid and pituitary glands were contoured and dose volume parameters extracted including the mean doses to thyroid and pituitary glands. Residual volume of thyroid gland receiving doses less than 20 Gy (V20 res), 30 Gy (V30 res), 40 Gy (V40 res) and 50 Gy (V50 res) were calculated. The LKB model was used for NTCP calculation and correlated with elevation in TSH levels.

Results
Median age was 14 years and had a median follow-up of 44 months. Mean thyroid and pituitary doses were 54.9 Gy (37.4-71.10) and 24.94 Gy (3.86-68.81) respectively. Overt hypothyroidism was documented in 41% (9) with Free serum T4 levels less than 0.94 (min 1.72). Overt & subclinical hypothyroidism was seen in 73% (16). Mean time to development of hypothyroidism was 29.8 months. The observed peak TSH levels did not correlate significantly with mean thyroid dose (p 0.224) or with V30 (p 0.359) and was independent of the mean pituitary dose. The residual 30Gy volume showed some correlation of the order of 0.412 (p 0.03). After a minimum of 12 months, 75% patients with V30 residual > 2cc were euthyroid while 83% with V30 residual <2cc developed hypothyroidism (p=0.046). Baseline Thyroid volume significantly predicted hypothyroidism (p 0.036, r= 0.0022). Thyroid volume showed cross-correlation with age, and was associated with higher T4 and lower TSH levels. NTCP calculated as per LKB model did not correlate with observed toxicity.

Conclusions
Thyroid Volume at the time of irradiation is an independent predictor for hypothyroidism. V30 residual >2cc seems to be a dose limiting parameter. NTCP models based on physical parameters alone are not accurate for predicting toxicities.

OP9
CHALLENGES IN EVALUATING PULMONARY TOXICITY AFTER THORACIC RADIOTHERAPY IN PEDIATRIC/YOUNG ADULT PATIENTS
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Purpose
To evaluate pulmonary toxicity following thoracic radiotherapy (TRT) in pediatric/young adult patients with metastatic solid tumors to the lung.

Methods
A large, single-institution, retrospective chart review was conducted of 81 consecutive pediatric/young adults who received TRT for metastatic solid tumors to the lung between 03/2005-2011 on an IRB-approved protocol. Descriptive statistical analyses were used to evaluate patient, tumor and treatment characteristics. Toxicity was measured using Common Terminology Criteria for Adverse Events version 4.0.

Results
Median age was 14 years (range, 1.5-27); 63% were male. Most common histologies included osteosarcoma (46%), Ewing sarcoma (25%), and rhabdomyosarcoma (10%). Treated tumors were on the right in 27%, left in 26%, and remainder bilateral or in mediastinum. Most (68%) had surgery and 1/3 multiple thoracotomies prior to TRT. A second course of TRT was used in 41%. Median lung volume was 2,035 cc (±2/3 volume of adult patients receiving TRT for primary lung cancer at our institution). 57 patients had a single or second course of TRT after 6 months; of these, 25 received standard fractionation (1.5-2 Gy/fraction), 28 hypofractionation (2.15-4 Gy/fraction), and others mixed or stereotactic TRT. Median mean lung dose for standard and hypofractionated patients was 13.7 Gy (range, 1.3-20) and 8.4 Gy (0.3-18.6), respectively; median maximum lung dose was 17.6 Gy (range, 1.7-40.7) and 38.6 Gy (1.1-58.8), respectively. Most patients experienced grade 2-4 cough and dyspnea 3 months to 9 years following TRT, and most had disease progression identified at time of symptom reporting. One patient had grade 3 pneumonitis 11 months after TRT, confirmed by bronchoscopy.

Conclusions
This investigation highlights vast heterogeneity of pediatric/young adult patients treated with and very low incidence of pulmonary toxicity following TRT. This work further underscores need to combine data from multiple institutions and importance of the PENTEC task force effort.
Introduction
The aim of this study was to evaluate the use of skull tracking in a real-time motion management system, named Skull Tracking®, for treatment of pediatric patients with intracranial SBRT. By using the real-time acquired images, its algorithm based on skull edges recognition calculates corrections for patient alignment with respect to digital reconstructed radiographies (DRR). DRR are automatically generated by Multiplan without any possibility of modifying their contrast despite skull bone density may vary. The question is of concern regarding pediatric patients due to a lowest skull bone density.

Materials and Methods
For intracranial SBRT in Cyberknife®, we compared, so far, 44 treatment fractions of pediatric patients with 9 treatment fractions of adult patients. The number of acquired images, the number of table movements and the time for patient alignment prior to the first treatment beam were analyzed.

Results
Based on patient ages, four patient groups were defined: <5, [5;10], [10;18] and adults. The mean number of acquired pairs of images for patient alignment was respectively estimated to 4.1±1.4 ; 4.2±2.2 ; 2.3±0.8 and 3.1±1.6. The mean number of table movements was estimated to 3.8±1.1 ; 3.7±1.1 ; 2.3±0.8 and 2.7±1.0. The mean time for patient alignment was quantified to 197±104s ; 201±92s ; 142±60s and 169±111s.

Discussion
The mean number of acquired images and the time for patient alignment prior to the first treatment beam was non-significantly different. The number of acquired images was previously identified as key to radiation therapy. We observed, by comparing the number of acquired images to the number of table movements, that the number of unusable acquired images (due to multiple choices of acquisition parameters) was non-significantly different. This means that the automatic DRR contrast is, in general, adapted for comparison with the real-time motion management system, named Skull Tracking®, to allow frameless intracranial SBRT. By using the real-time acquired images, its algorithm based on skull edges recognition calculates corrections for patient alignment with respect to digital reconstructed radiographies (DRR). DRR are automatically generated by Multiplan without any possibility of modifying their contrast despite skull bone density may vary. The question is of concern regarding pediatric patients due to a lowest skull bone density.

Conclusions
The supportive framework ensures that all paediatric patients coming for radiotherapy have equal access to tools and equipment that can appropriately and effectively prepare each individual child for their treatment, regardless of language and cultural differences.
PP5 MUSENTINE PREVENTS EARLY RADIATION-INDUCED ALTERATIONS IN DENDRITIC SPINES AND EXCITATORY SYNAPSES

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1Department of Neurosciences, 2Department of Radiation Oncology, The University of Texas MD Anderson Cancer Center, Houston, Texas, USA. 3Verna & Marrs McLean Department of Biochemistry and Molecular Biology, Baylor College of Medicine, Houston, Texas, USA.

Results

Accuracy of dose reporting is achievable, and physicists have been able to validate the technique. The MATBI technique is more tolerant of intrafraction variation and lower lung and kidney doses can be achieved.

Equipment designed for MATBI techniques:

1. A bespoke bed – patient can be lowered to floor
2. A two-part spoiler – to achieve maximum skin dose
3. A compensator bridge – to support lung and kidney shielding

ROMC are imaging with a DR (Digital Radiograph) system – previously only used in medical imaging.

Conclusion

The process of choosing and evolving this technique involved the collaboration of many disciplines over the past two years. The MATBI technique has been accepted and signed off by QIRC (Quality Assurance Review Centre). At the time of abstract submission, the MATBI technique has successfully been implemented with the first two children treated.

PP6 COMPARISON OF PEDIATRIC AND ADULT PATIENT NEAR-MISS INCIDENTS IN RADIATION THERAPY

Ralph P. Ermoian, MD, Aaron Kusano, MD, Jing Zeng, MD, Patricia A. Sponseller, MS, CMD, and Eric C. Ford, PhD

Purpose/Objective

We analyzed a radiation oncology departmental incident learning reporting system to assess the relative frequency of near miss incidents in pediatric patients compared to adult patients.

Materials/Methods

We analyzed 2835 incidents over a three-year period from a departmental reporting system designed to capture large numbers of near-miss incidents for the purpose of injury improvement. All incidents were prospectively reviewed weekly by a multi-disciplinary team. Incidents were assigned a near-miss severity score ranging from 0 to 4 (no harm to critical potential harm). Persons reporting the incidents were categorized as follows: attending physician, medical physicist, dosimetrist, therapist, and other. Comparisons between adult (<18 years old) and pediatric patients were made by chi-squared tests and t-tests.

Results

During this time, 239 pediatric patients and 2974 adult patients were treated. A higher percentage of pediatric patients had near-miss incidents associated with their treatment, 62% vs 44%, p < 0.01. Nine events were attributed to anesthesia. The number of near-miss incidents per patient was higher in pediatric patients than in adult patients, 1.30 +/- 1.53 vs 0.85 +/- 1.32, p < 0.001. The average severity of near-miss incidents between adult and pediatric patients was similar, 1.57 vs 1.61. The percentage of pediatric and adult patients with incidents reported by dosimetrists (22.6% vs 9.9%) and other (5.9% vs 5.9%) did not differ; however, higher percentages of pediatric had reports by attending physicians (20.5% vs 3.1%, p < 0.001), physicists (20.4% vs 15.4%, p = 0.023), and therapists (34.3% vs 22.9%, p < 0.001).

Conclusion

Pediatric patients’ treatments are more likely to be associated with near-miss incidents, and only rarely with anesthesia. Although this may be due to reporting bias, the severity of incidents is similar between the two age groups.
PP9
CRANIOSPINAL IRRADIATION USING VOLUMETRIC MODULATED ARC THERAPY WITH PARTIAL ARCS IN A CASE OF ADOLESCENT MEDULLOBLASTOMA
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Introduction
In a 14-year-old girl for craniospinal irradiation for medulloblastoma, we used VMAT-PA to improve dose homogeneity and dose to organs at risk.

Methods
We used a body couch, mask fixation, supine positioning, 6 MeV-photons for treatment to 23.4 Gy in the craniospinal axis, 54 Gy in the posterior fossa and 59.4 Gy in the residual tumor, calculated with Monte Carlo algorithm (Monac®, Elekta®). One isocenter for the brain and three isocenters for the spine with dynamic splitting (‘fathoming’ technique) were used. Regular cone beam CT-scans, an isocenter shift halfway through the treatment course for additional safety, and ScandoDent® phantom and Calibrtm® dosimetry films for quality assurance were utilized. Dose distribution was compared with a 3D-conformal plan.

Results
VMAT-PA provided better dose homogeneity in the planning target volume (PTV) than 3D (Gy mean/min/max 24.2, 17.9, 26.6 vs. 23.7, 15.9, 30.1). Using posterior-only and a reduced field size, VMAT-PA resulted in a decrease of 4% in the lung and a 7% increase for lateral organs (Gy). VMAT-PA vs. 3D for heart 7.9 / 12.6, lungs 4.3 / 3.2, kidneys 4.4 / 2.9, GIT 5.9 / 7.0, ovaries 4.6 / 8.0, breasts 1.9 / 0.8. VMAT-PA for the cranial PTV achieved a lower mean dose to the inner-rays compared to 3D (31.0 vs. 41.5 Gy). Film dosimetry verified smooth transitions between fields. Each craniospinal pure VMAT-PA took about 15 minutes. Positioning errors were (average shifts in mm, 3 directions): head 0.3 – 1.9, cervical 1.0 – 3.1, thoracic 3.3 – 4.9, lumbar 2.8 – 3.8. No CTCAE Grade 3 toxicity occurred. Post-treatment MRI showed complete remission.

Conclusions
VMAT-PA for craniospinal irradiation achieves homogeneous dose distribution, has potential to reduce late side effects and promises a higher therapeutic index.

PP10
TREATMENT APPROACHES, OUTCOMES, AND COMPLICATIONS IN INTRACRANIAL GERMINOMAS
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Purpose
To determine treatment approaches and outcomes of intracranial germinomas patients treated in British Columbia (BC).

Materials/Methods
Sixty-six patients were consecutively treated for intracranial germinoma in BC between 1975-2015. After retrospective chart review, patient and treatment characteristics and outcomes were analyzed using descriptive statistics, chi-square test, independent t-test and the Kaplan-Meier method.

Results
Median age at diagnosis was 15 years (range, 1-39). Median follow-up duration was 7.2 years. Of 66 patients, 38 received radiotherapy (RT) and chemotherapy (CT) and 25 received RT alone. RT volumes encompassed the craniospinal axis in 39% vs. 64%, respectively, the tumour bed and whole ventricles in 14% vs. 24%, and the tumour bed alone in 45% vs. 12% (p=0.02). Two patients (3%) had CT alone and one patient had surgery alone. At 5 and 10 years, relapse-free survival (RFS) was on average higher than disease-specific survival (DSS). On average, patients were treated with a standard technique (45% received RT alone), non-coplanar IMRT (23%), and proton technique (32% received proton alone). At 5 and 10 years, relapse-free survival (RFS) was 80% and 76%, disease-specific survival was 86% and 81%, overall survival was 86% and 76%, respectively. VMAT-PA for craniospinal irradiation achieved homogeneous dose distribution, has potential to reduce late side effects and promises a higher therapeutic index.

Conclusions
VMAT-PA for craniospinal irradiation achieves homogeneous dose distribution, has potential to reduce late side effects and promises a higher therapeutic index.

PP11
COMPARISON OF CONVENTIONAL, NON-COPLANAR IMRT AND PROTON BASED TECHNIQUES FOR CRANIOSPINAL IRRADIATION
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Introduction
Craniospinal irradiation is treated with craniospinal irradiation. Significant dose coverage of the PTV is needed in order to achieve tumor control. Sparing of normal tissue is important to reduce the risks of side effects and incidence of secondary cancer. We compare the standard CRT technique with planning techniques based on non-coplanar IMRT and protons with emphasis on the critical organs in the cranial region.

Materials and Methods
A four-year-old patient diagnosed with medulloblastoma was treated with the standard photon technique, employing lateral opposing fields for the brain and posterior single fields in the spinal region. A dose planning comparison study was done using a non-coplanar IMRT technique and a proton cranial prostate technique. The non-coplanar IMRT technique consisted of a set of five fields, three of these were non-coplanar. The proton plan consisted of four coplanar fields. The prescribed dose was 36 Gy.

Results
The proton plan significantly reduced the dose to the critical structures compared to the standard technique, see Table 1. But a large part of this improvement is also obtained by the non-coplanar IMRT technique. The mean dose to the eyes for the three techniques was 23.2 Gy for the standard, 14.5 Gy for the non-coplanar IMRT technique and 8.5 Gy for the proton technique. For the parotid gland the mean doses were 27.6 Gy, 20.7 Gy and 2.4 Gy. The coverage of the PTV was found to be 99.28%, 99.97% and 99.84% for the three techniques.

Conclusions
The proton based technique for the cranial part of the craniospinal axis was superior compared to the standard technique and the IMRT based technique. If protons radiotherapy is not a possibility an elaborated IMRT technique with non-coplanar beams could be considered for sparing eyes, parotid glands and lenses.

Table

<table>
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PP12
PEDIATRIC PROTON CONSORTIUM REGISTRY: EVALUATION OF CONSENTING VS NON-CONSENTING PATIENTS
William Hartsell1, Daniel Indelicato2, Anita Mahajan3, Christine Hill-Kayser2, Hallie Kasper1, Stephanie Perkins1, Andrew Chang1, Bree Eaton1, Heather Symecko1, Erin McDonnell1, Casey Neville4, Beow Yeap5, Sara Gallotto1, Megan Dunn1, Lisa Rake1, Torunn Yock1

Background / Methods
PPC is a multi-institutional prospective registry of pediatric patients treated at proton centers in the US. The local IRBs at two sites did not allow collection of any data for the “non-consenting” patients; the other four centers included brief data on non-consenting patients. We evaluated characteristics of patients on the study, to determine if there is a difference in the characteristics between consenting and non-consenting patients.

Results
60% patients were enrolled on the registry from 6 sites; 74 patients declined registry at 4 of the sites. The proportion of patients who consented to registry was 87.2% (505/579 patients). Three of 4 centers had greater than 90% of their patients on registry. 100 patients consented to the study from two other centers. The age range for patients consenting to registry was 0.2-21.8 years (median 8.2 years) and for non-consenting patients was 1-22 years (median 5.9 years). The tumor types were treated for females (57% vs 43%): for non-consenting patients 62% vs 38%. CNS primary tumors were most common: 62% vs 38% non-CNS for consenting, and 65% vs 35% for non-consenting patients. The majority of patients on the registry were white (81%); of patients in “other” categories were more likely to refuse consent for participation. Only 36% of pediatric patients came from the same state as the proton center; came from surrounding states and 24% from distant states, 20% of patients came from international sites. Patients from the state where the proton center was located were more likely to refuse participation in the registry study.

Conclusions
1) Even when consent is required, most pediatric patients can be included on a prospective registry. 2) Proton centers are regional/international resources for pediatric patients. 3) Patients from locations further from the treating center were more likely to consent to registry.
Most of pts with complete response consist of total resection pts after surgery. Treatment failure was occurred mostly in 2 yrs.

Materials/Methods

The right eye of a 2-year-old female patient with bilateral retinoblastoma was enucleated and the left eye underwent external radiotherapy after failing chemoreduction and focal therapies. Treatment plans for patient were developed using six techniques including an on an face electron technique (ET), an anterior and lateral wedge photon technique (2LT), three dimensional conformal (6 fields) technique (CRT), an inverse plan intensity modulated radiation therapy (IMRT), tomotherapy, and conventional focal stereotactic external beam radiotherapy with Cyberknife (SBRT). Dose volume analysis carried out for each technique.

Results

All techniques except electron provided similar target coverage. The electron technique had the highest planning target volume dose gradient. When compared with plan with IMRT and SBRT, there was no significant difference for PTV dose distribution. For the IMRT, tomotherapy and SBRT, volum 95% of the PTV was covered 99.5%, 99.2% and 99.2% of the prescribed dose respectively. The mean volume of ipsilateral bony orbit receiving more than 20 Gy was suggested as a threshold for bone growth inhibition. The V20 Gy was 73% for the ET, 57% for the 2LT, 47% for the CRT, 65% for the IMRT, 66% for the tomotherapy, 2.7% for CRT.

Conclusions

With more sophisticated radiation therapy planning and delivery techniques, an advantage have been achieved over the other techniques. This work supports the potential use of IMRT and SBRT to spare normal tissues in these patients.
PP17
VOLUME AND POSITION SHIFT OF THE FOURTH VENTRICLE: A RELEVANT ISSUE FOR CONFORMAL IRRADIATION OF THE TUMORBED IN MEDULLOBLASTOMA
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(4) Department of Neurosurgery, Radboud University Medical Centre, Nijmegen, The Netherlands

Purpose
After complete microscopic removal of a medulloblastoma, the tumorbord is defined based on pre-operative tumor extent and anatomic shifts or changes visible on T1-cadgolinium MR-images. In this era of image-guided radiation techniques, it is important to investigate the change in volume and position of the fourth ventricle and to implement this information in the target volume definition for high-precision radiotherapy.

Materials/Methods
Ten patients with medulloblastoma and complete microscopic removal of the tumor were selected. Onset of radiotherapy within one month from surgery was noticed as well as MR-imaging repeated 6 weeks after the end of radiotherapy. Deformation of the fourth ventricle was performed in a standardized way based on post-surgery, pre-radiotherapy and post-radiotherapy imaging and registered to the treatment planning CT-scan. The Dice similarity coefficient was used to evaluate spatial overlap (0-1) of the fourth ventricle contours between CT- and MR-imaging after co-registration based on bony structures.

Results
Imaging was performed at a mean of 2 and 18 days post-surgery and repeated at a mean interval of 45 days after the end of radiotherapy. The mean post-operative, pre-radiotherapy and post-radiotherapy fourth ventricle volumes were 6.4 cm³ (2.5-11.8 cm³), 4.3 cm³ (2.3-6.5 cm³) and 4.0 cm³ (1.7-6.3 cm³), respectively. Volume reduction more than 0.5 cm³ between pre- and post-radiotherapy imaging was limited to 3 patients (0.5-1.6 cm³). Co-registration of the treatment planning CT-scan with post-radiotherapy MR based on bony anatomy resulted in a mean fourth ventricle shift of 4 mm (2-9 mm), especially in the dorsal and crano-caudal direction, resulting in a spatial overlap of 0.65 (0.50-0.84).

Conclusions
During radiotherapy volume change of the fourth ventricle is limited. However, significant position shifts of the fourth ventricle up to 9 mm are observed, especially in the dorsal and crono-caudal direction. To prevent geographic miss of radiotherapy, image-guidance is obligate.

PP18
THE ROLE OF RADIOThERAPY IN THE Diffuse INTRInsic PONTINE GLIOMAs OF CHILDhOod: DOES ChEmOTHERAPY HAVE ANY EFFECT ON SURvIVAL?
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1Ege University Hospital, Dept.Radiation Oncology, 2Ege University Hospital, Dept.Pediatric Oncology, 3Bafıce University Children’s Hospital, Dept. Pediatric Oncology, 4Kemal Research Hospital, Dept.Pediatric Oncology, 5Ege University Hospital, Dept.Pediatric Neurosurgery, 6Imr, Turkey

Introduction
The diffuse pontine gliomas of childhood (DIPG) are tumors with very poor prognosis with a median survival of less than 1 year. The main treatment option is radiotherapy which may improve the symptoms of the patients temporarily. Many chemotherapy schemes were used but failed to show any survival benefit.

Materials/Methods
Between 1988-2014, 79 children with a diagnosis of DIPG were treated with radiotherapy at the Ege University Hospital. Median age was 8 (range 2-17); 44 were female and 35 were males. Radiotherapy was administered with 1.8 Gy daily fractions to a total dose of 54-59.4 Gy in 6-6.5 weeks. Until 2007 radiotherapy alone was the standard care of these patients, where chemotherapy was used in case tumor progression. Between 2007-2012 in addition to radiotherapy concomitant and adjuvant temozolomide (Stupp regimen) was routinely used in 22 patients, and starting from 2012 nimotuzumab-vinorelbine combination was used in 4 patients. Thus a total of 26 patients received chemoterapy together with irradiation. Different chemotherapy combinations were used in case of progression.

Results
Survival data was analysed in December 2014. 69 patients were succumbed to disease, 10 patients were alive and median survival was 8.9 ± 0.8 months. Median survival was 7.8 ± 1.6 months in patients treated with radiotherapy alone, and 15.0 ± 1.7 months in whom received chemotherapy as well. The difference was statistically significant (p<0.02). 1-year survival was 26.4% in the radiotherapy alone group and 62.5% in the combination group, however this difference faded away in at the end of 2nd year (11.3 vs. 13.0%).

Conclusions
Addition of chemotherapy to radiotherapy in children with DIPG delays tumor progression around 6 months, but does not provide long-term tumor control.
PP22

PEDIATRIC RADIATION ONCOLOGY PRACTICE PATTERNS AFTER THE AVAILABILITY OF PROTON THERAPY

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MD Anderson Cancer Center, Houston, TX

Purpose/Objective(S)
This study describes pediatric radiation therapy (RT) practice patterns after proton therapy (PRT) became available for use.

Materials/Methods
Patients age <19 y at first RT were identified. Patient characteristics, RT modality, treatment site and diagnosis were recorded. Trends in RT practice over time were evaluated.

Results
1671 patients <19 y were treated between 1/2006-12/2014. 775 and 896 patients received PRT and non-PRT (55% and 58% male), respectively. 41% and 21% of the PRT and non-PRT patients were <5 yrs of age (p=0.001). 67% vs 45% were Caucasian in the PRT vs non-PRT groups, respectively (p<0.001). 64 patients received PRT in the first full year (2007) with a median of 101 patients/yr thereafter (range 64-131). A median of 51 patients/yr received non-PRT (range 80-123). A median of 41% of the total cohort received PRT per year (range 38-62%). Special non-PRT procedures (SRS, SBRT, IORT, brachytherapy) were used in 33 patients. One patient received proton-SBRT. The most common treatment sites for PRT were CNS, head & neck and pelvic: 73%, 12% and 5%, respectively. In the non-PRT cohort, the most common RT sites were TBI, CNS and abdomen: 30%, 21% and 10%, respectively. In the PRT vs non-PRT cohorts, 82% vs 26% received >24 fractions (p<0.001); 2% vs 47% received <11 fractions (p<0.001). Only 2 patients received mixed PRT/non-PRT in a RT course. 47 PRT patients had at least one additional course of RT, 13/47 received a second PRT. 167 non-PRT patients received at least one subsequent RT. Of these, only 2 received salvage PRT. In total, 1975 courses of RT were delivered.

Conclusion
Despite the introduction of PRT, approximately 50% of pediatric patients are treated with non-PRT techniques including specialized hypofractionated approaches. Pediatric radiation oncologists need access to comprehensive RT modality options to provide optimal patient centered care.

PP23

USE OF HYPNOSIS IN RADIOThERAPY AS AN ALTERNATIVE TO GENERAL ANESTHESIA IN PEDIATRIC RADIATION ONCOLOGY

Sardinine Mancini, Anita DUCAN, Magali MORELLE, Christian Carrie, Perrine MAREC-BERARD and Line CLAUDE

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2 Department of paediatric oncology, Institut l’Hématologie et le Cancer Pédiatrique, (IHP) 69008 Lyon, France
3 Clinical Research and Innovation Division (DRIC), Cancer Centre Leon Bérard, 69008 Lyon, France; University of Lyon, 69007 Lyon; CDRAS, GATE Lyon-St Étienne; UFR LTMB2, 69135 Ecully, France.

Background
Even though general anesthesia (GA) is effective and has proof of safety for the necessary immobilization of patients during radiation therapy (RT) sessions, it may be time-consuming and costly. The use of rituals and/or hypnosis has been encouraged in multiple fields of medicine, enabling distraction for uncomfortable moments of treatment and it seems children have a natural propensity for it. This observational study which took place in the RT children cancer department (Leon Berard regional center, Lyon, France) aimed to evaluate the place of the alternative of rituals and/or hypnosis in RT.

Methods
Two time periods, before and after 2008 (2003 – 2013) have been compared, the second one introducing accompanying methods such as hypnosis systematically. 137 children < 5 years benefited from RT in that period and were included (70 pts before 2008, 64 after 2008).

Results
There was no significant difference between the two populations for age, sex, localization of the RT. There was significantly more high-technicinity RT in the second period (17% vs 41%; p<0.001). There was no significant reduction in the use of GA (57% vs 53%: p = 0.235) globally but the techniques used on the second period were more sophisticated (longer sessions, optimal asset, limited margins...) and GA should have been more frequent. The pts that used to undergo RT without GA were the oldest and the patients treated for abdominal lesions.

Conclusion
Also globally this study did not find a significant reduction in the use of GA after introduction of extra accomplishment and hypnosis in young children receiving RT; this drug – free technique could limit its logical increasing use in a world where in parallel RT techniques have greatly evolved in precision.
demonstrating effectiveness and safety of protons for pediatric tumors. At Trento Proton Center, we expect to treat in a very near future pediatric patients and to contribute to the limited but growing body of literature because already treated with high doses of radiation.

rhabdoid tumor (1), pituitary germinoma (2), osteosarcoma (1), malignant schwannoma (1). Nineteen patients were evaluated eligible to receive primitive neuroectodermal tumor (3), choroid plexus carcinoma (1), Ewing sarcoma (2), low-grade glioma (3), chordoma (1), atypical teratoid

(range, 1-20) and the histology was: rhabdomyosarcoma (2), high-risk medulloblastoma (4), diffuse intrinsic pons glioma (2), meningioma (2),

We evaluated 25 pediatric cases (21 national and 4 international) referred by physicians, parents and family members. The mean age was 9 year

facility started clinical activity on adult patients; the plan is to accept pediatric patients around six months later.

isocentre) and spot size (σ 3-7mm in air at isocentre). Each treatment room is equipped with a gantry which allows 360° rotation of the beam line, 6

Design/Methods

of normal tissues with the consequent reduction of acute and late toxicities.

Conclusion

TUMORS AT THE NEW PROTON FACILITY IN TRENTO IMPLEMENTATION OF PROTON THERAPY FOR PEDIATRIC NEUROBLASTOMA

PP25 IMPLEMENTATION OF PROTON THERAPY FOR PEDIATRIC TUMORS AT THE NEW PROTON FACILITY IN TRENTO

Background/Objectives

Although both photon and proton radiation techniques permit similar target volume coverage, the physical properties of protons allow a better sparing of normal tissues with the consequent reduction of acute and late toxicities.

Design/Methods

The Trento facility is equipped with active beam delivery based on spot scanning. A cyclotron provides beams of variable energy (70-226 MeV at isocentre) and spot size (σ 3-7mm in air at isocentre). Each treatment room is equipped with a gantry which allows 360° rotation of the beam line, 6 degrees of freedom robotic treatment table, two orthogonal X-ray devices, a CT on-rails in one room and a cone-beam CT in the other. Two horizontal isocentre lines are placed in a third room. The center is equipped also with a dedicated CT and 1 ST MR and an anesthesia area. In October 2014 the facility started clinical activity on adult patients; the plan is to accept pediatric patients around six months later.

We evaluated 25 pediatric cases (21 national and 4 international) referred by physicians, parents and family members. The mean age was 9 year (range, 1-20) and the histology was: rhabdomyosarcoma (2), high-risk medulloblastoma (4), diffuse intrinsic pons glioma (2), meningioma (2), primitive neuroectodermal tumor (3), thalidomide plexus carcinoma (1), Ewing sarcoma (2), low-grade glioma (2), chordoma (1), atypical teratoid rhabdoid tumor (1), pituitary germinoma (2), osteosarcoma (1), malignant schwannoma (1). Nineteen patients were evaluated eligible to receive prostate radiation although the radiation timing was not always correctly set. Six patients were declined due to metastatic progression of disease or because already treated with high doses of radiation.

Conclusion

At Trento Proton Center, we expect to treat in a very near future pediatric patients and to contribute to the limited but growing body of literature demonstrating effectiveness and safety of protons for pediatric tumors.
**PP28**

**REDUCING THE DOSIMETRIC IMPACT OF POSITIONAL ERRORS AT MULTI-ISOCENTER CRANIOSPINAL IRRADIATION USING VMAT**

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**Introduction**

Volumetric modulated arc therapy (VMAT) is a viable option for cranio-spinal irradiation [1]. The size of the planning target volume (PTV) requires a multi-isocenter approach. Multi-isocenter VMAT planning support in the treatment planning system (TPS) often yields a transition area which is not optimally robust towards small positional errors at patient setup. A procedure to reduce the dosimetric impact of positional errors is proposed.

**Materials/Methods**

An adolescent female patient (18 yrs) was selected as a test case. PTV encompassed the whole brain and spinal cord, resulting in a total length of 75.9 cm. VMAT technique with 3 isocenters in the cranial, thoracic and abdominal region was chosen. The treatment plan (TP) for the thoracic region was done first, comprising a central region (14.4 cm) with a homogeneous dose prescription and two 10.8 cm transitional regions. Each of the transitional regions was further divided into 9 sub-regions, with the dose prescription in each sub-region gradually increasing from the periphery towards the center. The TP covering the cranial and abdominal regions was done afterwards, taking into account the TP for the thoracic region. The treatment machine used was Varian Unique Performance, and Eclipse 10.0 TP was used. The TP was verified using Scanditools Delta4 and EBT3 radiochromic film [2].

**Results**

The procedure described yielded a transition region in which the overlapping fields exhibited a dose gradient with only minor deviations from linearity. A simulated positional error resulted in a dosimetric change which was close to the minimal possible for the given positional error. Both TP verifications confirmed the dose calculations.

**Conclusion**

Using an appropriate treatment planning procedure, it is possible to create a TP with overlapping fields which exhibits a smaller dosimetric dependence on minor positional errors in patient setup.

**References**


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**PP29**

**HIPPOCAMPAL-SPARING TECHNIQUES IN PEDIATRIC BRAIN TUMORS: A DOSIMETRIC COMPARISON BETWEEN HELICAL TOMOTHERAPY AND PROTON THERAPY**

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**Purpose**

The hippocampus has an important role in long-term memory and spatial navigation. The efforts in radiotherapy treatments to save this organ are increasing. The aim of this report is to investigate if proton therapy can play a role in saving the hippocampus.

**Materials/Methods**

Planning of three pediatric patients with different cerebral tumor locations (2 posterior fossaependymomas, 1 chiasmatic-hypothalamic astrocytoma, 1 suprasellar craniopharyngioma, 1 preoral germinoma) placed near the hippocampus, were developed for helical tomotherapy (HT) and pencil beam scanning proton therapy (PT). PT plans were performed with “single field optimization” technique, to increase the plan’s robustness. PT plans were optimized assuming a constant Relative Biological Effectiveness of protons of 1.1. Prescribed doses followed the recommendations of the European protocols. The planner could further reduce the dose to the hippocampus if PTV(s) constraints were reached.

**Results**

In all the plans, HT had always respected the constraint for the sum of the hippocampi (D40%≤7.3Gy), while HT had never respected it. In the five plans, the best and worst results for this constraint were 0.2Gy and 6.44Gy for PT and 9.3 Gy and 18.3 Gy for HT, respectively. The average dose for PTV (HT was 2.9Gy and 13,8Gy=0.018), respectively. Regarding the other dosimetric data of the comparison, similar results for target coverage (differences in V95%>0.1%/1Gy) were observed both with PT and HT. Concerning the OARs, the two techniques respected the OARs constraints in all the plans.

**Conclusion**

Pencil beam scanning PT could be an interesting solution in the treatment of cerebral pediatric tumor in order to decrease the hippocampus dose and toxicity, compared to HT.
SOCIAL EVENTS
2015 PROS Annual Meeting Program

Wednesday, June 24th - 18:30-19:30 - Garden Hall
Welcome reception
All guests are warmly invited to share a gathering moment from 6:30 pm at the Grand Hotel Union.

Friday, June 26th - 20:00-22:30 - The Ljubljana Castle
Dinner of the Congress
The PROS dinner will take place at the Ljubljana Castle from 8:00 pm. Upon registration only.

Itinerary from the Grand Hotel Union to Ljubljana Castle

Friday, June 26th - 08:00 - 19:00
Predjama & Lipica Coast
Departure from Ljubljana
Driving to the southwest of the country, where lies the stoned territory named Karst. It is a land of a rare beauty, mysterious underground of waters and caves, special karst climate and scarce vegetation.

Journey
First stop is in idle village Predjama, where up the wall lies Predjama castle. Next stop is Lipica, where centuries ago, a Karst horse was grazing there. It was an ancestor of the Lipizzan horse we know today. Later, the road will take us to the Italy, where we will take a short stop to see the central part of Trieste. Then driving to the pearl of slovenian coast – Piran which attracts numerous visitors with its picturesque location and rich cultural heritage.

Included: transfer, guiding, entrance to the Predjama castle, entrance fee to Lipica stud farm, costs of the organisation

Map of Ljubljana

Saturday, June 27th - 13:00-19:00
An afternoon trip to the Lake Bled
For all participants at the end of the Congress (upon registration only)
Experience a day at the charming Lake Bled, famous for a church on an island in the middle of a lake, a medieval castle perched on a cliff high above the lake, and splendid views of surrounding Alpine peaks.

Included in the tour: bus transfer, guiding, entrance fee to the Bled castle, church, pletna boat ride, the cost of the organisation
Discover PD-1: An immune checkpoint pathway\(^1\)

Some tumor cells can evade the body’s immune response, which may result in disease progression\(^2,3\)

- One function of the body’s immune response is to detect and destroy tumor cells through activated T cells and other mechanisms; tumor cells express multiple antigens that are not expressed in normal tissue.\(^1–3\)

- However, some tumor cells may evade the body’s immune response by exploiting the PD-1 checkpoint pathway through expression of the dual PD-1 ligands PD-L1 and PD-L2.\(^1,2,4–7\)

- PD-L1 and PD-L2 engage the PD-1 receptor on T cells in order to inactivate T cells, which may allow tumor cells to evade the immune response.\(^1,2,8\)

MSD is committed to furthering the understanding of immunology in cancer, including the role of the PD-1 pathway.

Visit the MSD booth to learn more.

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**References:**


Mark Sharp & Osazee, innovation.zibavita d.o.o.

\(PD-1=\) programmed cell death protein 1; \(PD-L1=\) programmed cell death ligand 1; \(PD-L2=\) programmed cell death ligand 2.