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Zeszyty Naukowe WCO, Letters in Oncology Science 2018;15 (Appx. 2):1-30

Letters in Oncology Science
ISSN 2543-6724
ZESZYTY NAUKOWE WIELKOPOLSKIEGO CENTRUM ONKOLOGII

Young Scientists' Forum
Konferencja Młodych Naukowców

November 22nd, 2018, Poznan
http://www.wco.pl/ysf2018/pl/

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Invitation YSF Poznan, November 22nd, 2018

Together with Honorary Chair Prof. Julian Malicki, we would like to invite all young scientists to participate in the Young Scientists' Forum, which will take place in Poznan, Poland on November 22nd, 2018. This conference is open to radiation oncologists, medical physicists and radiobiologists age 35 or younger. Residents in training, young specialists, and PhD students are all welcome.

The aim of this Forum is to promote the achievements of young scientists, to help in their professional development, and to create a strong platform to exchange professional experiences.

We encourage all young scientists involved in research to submit an abstract. Abstracts should be submitted in English. All abstracts will be evaluated by an international jury consisting of leading experts in radiotherapy, radiobiology, and medical physics. Oral presentations of accepted abstracts will consist of a ten-minute presentation of the research followed by a ten-minute discussion. The deadline for abstract submission is 26nd of October 2018.

All presentations will be assessed by the international jury, which will consider both the content and presentation of the research as well as the presenter's ability to lead a scientific discussion. The best presentations will receive one of the many awards intended to support professional and scientific development.

Feel free to contact conference bureau for more information. We look forward to your participation in the Young Scientists' Forum.

See you in Poznan!

Dr Joanna Kazmierska
Chair Scientific Committee

Zaproszenie Konferencja Młodych Naukowców, 22 listopada 2018

Koleżanki i Koledzy,

Serdecznie zapraszamy wszystkich Młodych Naukowców, do udziału w kolejnej edycji Young Scientists' Forum, które odbędzie się 22.11.2018 r. w Poznaniu.

Jest to konferencja dedykowana młodym naukowcom przed 35 rokiem życia, specjalizującym się w radioterapii, fizyce medycznej oraz radiobiologii. Forum stwarza doskonałą okazję do wymiany doświadczeń zawodowych oraz zawierania nowych kontaktów na poziomie krajowym i międzynarodowym. Honorowy patronat naukowy nad Forum objął profesor Julian Malicki - Dyrektor Wielkopolskiego Centrum Onkologii.

Zgłoszone abstrakty będzie oceniało międzynarodowe jury, reprezentowane przez światowych ekspertów z dziedziny radioterapii, radiobiologii oraz fizyki medycznej.

Prace zaakceptowane do prezentacji ustnej, będą przedstawione w formie 10 minutowej prezentacji i 10 minutowej dyskusji. Obie części wystąpienia są jednakowo oceniane - zarówno pomysł, wyniki prezentowanego badania, jak i umiejętność przeprowadzenia naukowej dyskusji.

Zachęcamy do nadsyłania prac - abstrakty należy zgłaszać w języku angielskim do 26.10.2018 r. Dla autorów najwyżej ocenionych prac przewidziane są różnorodne nagrody wspierające karierę i rozwój naukowy.

Serdecznie zapraszamy do udziału!

W imieniu Komitetu Naukowego
Dr Joanna Kaźmierska

PATRONAT HONOROWY

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Radiobiology Lab

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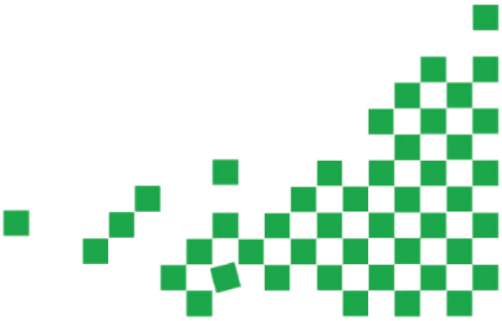

wielkopolskie centrum **onkologii**

Scientific program

08.30	**The Opening of the Young Scientists' Forum - dr Joanna Kaźmierska**
08.40-10.40	**Session 1: CLINICAL** **Chair: Dr Joanna Kaźmierska** **Presentation of 6 abstracts selected for oral presentation** 1. Is volumetric staging an alternative to TNM staging system in radiotherapy of tongue cancer? *Marcin Miszczyk, Aleksandra Napieralska, Bogusław Maciejewski.* 2. Carbon-ion reirradiation for recurrent head-and-neck cancer: A single-institutional experience. Thomas Held, Paul Windisch, Sati Akbaba, Kristin Lang, Denise Bernhardt, Peter Plinkert, Kolja Freier, Steffen Kargus, Stefan Rieken, Klaus Herfarth, Jürgen Debus, Sebastian Adeberg. 3. 18F-FDG PET/CT biphasic study in determination of the malignant vs non-malignant status in pharyngeal subsites lesions - the head and neck cohort study. *Agata Karolina Pietrzak, Andrzej Marszałek, Paweł Golusiński, Witold Cholewiński.* 4. Preoperative hypofractionated radiotherapy with sequential chemotherapy in primary marginally unresectable or marginally resectable high grade soft tissue sarcomas of extremities or trunk wall: an interim analysis of prospective phase II clinical trial. *Mateusz Spałek, Hanna Koseła-Paterczyk, Aneta Borkowska, Michał Wągrodzki, Anna Szumera-Ciećkiewicz, Andrzej Cieszanowski, Patrycja Castaneda-Wysocka, Tomasz Świtaj, Monika Dudzisz-Śledź, Anna Czarnecka, Edyta Dąbrowska-Szewczyk, Piotr Rutkowski.* 5. Impact of diaphragm dome delineation on treatment position of breast cancer patients irradiated in DIBH technique. *Łukasz Raszewski, Dominika Borowczak, Dorota Galas - Świdurska, Ewelina Konstanty.* 6. Liver exposure to radiation during right breast cancer radiotherapy. *Urszula Sobocka-Kurdyk.*
10.40-11.10	**Coffee break**
11.10-12.50	**Session 2: RADIOBIOLOGY** **Chair: Dr hab. Wiktoria Suchorska** **Presentation of 5 abstracts selected for oral presentation** 1. Development of a preclinical model to investigate radiation effects after proton brain irradiation. *Suckert Theresa, Johannes Müller, Elke Beyreuther, Antje Dietrich, Cläre Von Neubeck, Armin Lühr, Mechthild Krause.* 2. Influence of chemotherapeutics and irradiation on lncRNAs expression in HNSCC cell lines. *Kacper Guglas, Tomasz Kolenda, Marcel Ryś, Anna Teresiak, Renata Bliźniak, Izabela Łasińska, Jacek Mackiewicz, Katarzyna Lamperska.* 3. Surgical wound fluids collected from breast cancer patients increase migration of cancer cells, however this effect is impaired by intraoperative radiotherapy through radiation-induced bystander effect. *Igor Piotrowski, Katarzyna Kulcenty, Karolina Zaleska, Mateusz Wichtowski, Joanna Wróblewska, Dawid Murawa, Wiktoria Suchorska.* 4. MRI guided Magneto-Chemotherapy with high magnetic moment nanoparticles for cancer theranostics. *Nanasaheb Thorat, Joanna Bauer.* 5. The Influence of HPV on lncRNA Expression in Head and Neck Squamous Cell Carcinomas. *Magda Kopczyńska, Tomasz Kolenda, Kacper Guglas, Anna Teresiak, Renata Bliźniak, Izabela Łasińska, Jacek Mackiewicz.*

12.50-13.40	**Lunch**
13.40-15.40	**Session 3: MEDICAL PHYSICS** **Chair: Prof. Julian Malicki** **Presentation of 6 abstracts selected for oral presentation** 1. Machine specific QA of Multileaf Collimator with Artiscan software. *Hubert Szweda, Bartosz Pawałowski.* 2. Comparison of treatment plans created for the linear accelerators with different types of linac head designs. *Magdalena Charmacińska, Agnieszka Skrobała, Bartosz Pawałowski.* 3. Analysis of daily portal imaging verification before irradiation process using the DIBH technique in patients with left-sided breast cancer. *Karolina Byczkowska, Julia Jędrzejewska.* 4. Digital transformation in the evaluation of the image contrast in the quality control of EPID. *Hubert Stankiewicz, Barbara Drzewiecka, Zbigniew Fojud.* 5. Comparison study of treatment plans for three SBRT techniques: VMAT, IMRT and CyberKnife for low-risk prostate cancer. *Dorota Borowicz, Agnieszka Skrobała.* 6. Modelling head and neck radiotherapy outcomes using radiomics biomarkers. *Petros Kalendralis, Zhenwei Shi, Johan Van Soest, Adam Ryczkowski, Andre Dekker, Leonard Wee.*
15.40-15.55	**Coffee break**
15.55-16.15	**Poster discussion** **Chair: Bartosz Bąk** 1. Correlation between the infection of HPV virus and bladder cancer. *Maria Malarska, Edyta Borkowska, M Bernat, Magdalena Traczyk-Borszyńska, P Kutwin, Z Jabłonowski, Maciej Borowiec.* 2. Micro RNA hsa-miR-6510-3p: potential tumor suppressor in head and neck cancer. *Agnieszka Sobecka, Pawel Golusiński, Michal M. Masternak, Wiktoria M. Suchorska, Wojciech Golusiński.* 3. Thymic tumours: the role of radiotherapy. *Aleksandra Napieralska, Leszek Miszczyk.* 4. Considering the Spatial Organisation of DNA to *Assess Proton Therapy Relative Biological Effectiveness. Natasha* Gilmour, Michael Merchant.
16.15	**Award Ceremony and closing remarks**

Spis treści

ABSTRACTS / STRESZCZENIA

Session 1

Is volumetric staging an alternative to TNM staging system in radiotherapy of tongue cancer?

- **Marcin Miszczyk, Aleksandra Napieralska, Bogusław Maciejewski,**
- Instytut im. Marii Skłodowskiej-Curie Oddział w Gliwicach

Background:

The purpose of this study is to evaluate the prognostic value of GTV-based volumetric staging system (VS) in tongue cancer patients and compare it with the results based on the TNM staging system.

Material/methods:

The clinical material consists of 99 consecutive patients with anterior or base of tongue cancers, aged 25-83 (median 58,2), treated with radical radiotherapy or chemoradiotherapy as a primary treatment between 2002 and 2014 in a single institution. The study excluded patients with prior surgical treatment. Total dose of 64-78 Gy was delivered to the primary site. Neoadjuvant chemotherapy was administered in 7 cases, concurrent in 15 cases and both in 8 cases. The study group was retrospectively assessed using TNM classification (7th edition) and VS with 5-year overall survival (5yOS) and 3-year disease-free survival (3yDFS) as endpoints. VS divided patients according to the total gross tumor volume. The cut-off values of 15 and 70 cubic centimeters (cc) were adapted from works by Studer et al. based on retrospective analysis of the frequency of local failures in particular GTV ranges.

Results:

TNM stage groups correlated well with mean GTV (p=0.0001) but the standard deviation of GTV overlapped between patients with TNM stage I-III, II-IVa and III-IVc. TNM stage groups did not correlate well with 5yOS (p=0.1). Patients with TNM stage IVa-IVc proved to have only marginally worse 5yOS than patients with TNM stage I-II disease. The volumetric stage correlated well with 5yOS (p=0,001) separating patients into groups with distinctly different prognosis. There was no statistically significant correlation between 3yDFS and TNM stage group (p=0,05). VS correlated with 3yDFS (p=0,0001) and it was 69% for patients with GTV<15cc, 32% for patients with GTV between 15 and 70cc and 0% for patients with GTV>70cc. In multivariate Cox regression model VS reached statistically significant p-value of p=0.00006.

Conclusion:

Volumetric staging could be used as a prognostic tool in tongue cancer patients treated with radical RT and proved to be more accurate than TNM staging system at predicting 5-year overall survival and 3-year disease-free survival.

Carbon-ion reirradiation for recurrent head-and-neck cancer: A single-institutional experience

- **Thomas Held, Paul Windisch, Sati Akbaba, Kristin Lang, Denise Bernhardt, Peter Plinkert, Kolja Freier, Steffen Kargus, Stefan Rieken, Klaus Herfarth, Jürgen Debus, Sebastian Adeberg**
- University Hospital of Heidelberg, Im Neuenheimer Feld 400, 69120 Heidelberg

Background:

To assess the feasibility and safety of carbon-ion reirradiation (CIR) in therapy-refractory patients with recurrent or progressive head-and-neck cancer (HNC).

Material/methods:

Two-hundred and twenty-nine consecutive patients with locally recurrent head-and-neck cancer treated with CIR at our clinic between 2010 and 2017 were analyzed retrospectively regarding progression free survival (PFS), overall survival (OS), pattern of failure and toxicity. Acute (initial 90 days after CIR) and late toxicity were assessed using NCI CTCAE v4.03.

Results:

The median age at treatment start was 59 years (range 22 – 89 years) and the median time between initial irradiation and CIR was 3.9 years (range 0.3 – 46.5 years). On average, patients received 3 (range 1 – 8) tumor-specific treatments before CIR. 54% of primary tumors were adenoid cystic carcinomas (ACC), 25% were squamous cell carcinomas, 7% were adenocarcinomas and 14% were other tumor entities. Most common tumor sites were salivary glands (24%), nasopharynx (23%), paranasal sinus (21%), oral cavity (10%) and oropharynx (8%). The median planning target volume of CIR was 128.9 ccm (range 13.3 – 925.0 ccm), patients received a median dose of 51 Gy(RBE) (range 30 – 66 Gy(RBE)) in 3 Gy(RBE) fractions and the median cumulative applied lifetime dose after CIR was 132.8 BED2Gy (range 88.8 – 155.0 BED2Gy). Median local PFS after CIR was 18.9 months (95% CI 14.2 – 23.6 months) and median overall survival after CIR was 24.8 months (95% CI 20.5 – 29.0 months). 94% of local recurrences after CIR were in-field. Serious acute toxicity (≥grade 3) after CIR included dysphagia °III (n=3; 1.3%), fistula °III (n=1; 0.4%), impaired hearing °III (n=1; 0.4%) and laryngeal edema °IV (n=2; 0.9%). Late toxicities of grade 3 or higher (n=13; 11.5%) included fistula °III (n=1; 0.9%), osteonecrosis °III (n=1; 0.9%), impaired hearing (n=5; 4.4%), optic nerve disorder °III / IV (n=2; 1.8% / n=2; 1.8%), brain necrosis °IV (n=1; 0.9%) and carotid blowout °IV (n=1; 0.9%).

Conclusion:

CIR in patients with locally recurrent or progressive head-and-neck cancer is a feasible and effective treatment option with acceptable toxicity and good local control, representing a valuable alternative to surgical salvage and palliative chemotherapy in selected patients.

18F-FDG PET/CT biphasic study in determination of the malignant vs non-malignant status in pharyngeal subsites lesions - the head and neck cohort study

- **Agata Karolina Pietrzak, Andrzej Marszałek, Paweł Golusiński, Witold Cholewiński**
- Greater Poland Cancer Centre, Poznan

Background:

The aim of this study was to exercise the delayed 18F-FDG PET/CT examinations in distinguishing normal and abnormal lesions observed in the head and neck cancer patients with special focus on the lesions of the pharyngeal subsites.

Material/methods:

Total of 152 patients underwent sequential dual-time-point (DTP) 18F-FDG PET/CT studies at 60 and 90 minutes (min) post injection (p.i.) of the radiopharmaceutical 18F-FDG. The 93 malignant lesions within oropharynx, nasopharynx and hypopharynx were delineated and analyzed in the term of metabolic activity using the maximal and mean Standardized Uptake Value (SUVmax, SUVmean) measurements. The 59 pathologic but non-malignant lesions in 59 patients were observed and analyzed for comparison purposes as well as 70 normal cervical blood vessels obtained randomly in 152 patients,. We have calculated the SUVmax, SUVmean values and performed the Receiver Operating Characteristics Curves (ROC) analysis to find the predictive SUVmax value cut-off which might be helpful in distinguishing normal and pathologic glucose metabolism activity within the region of interest (ROI).

Results:

The metabolic activity at 60 and 90min post injection (p.i.) of the 18F-FDG within the pharyngeal cancer lesions were significantly higher and noticeably increasing over time when compared to normal and non-malignant structures (5.52±2.75 and 6.11±2.92, 1.43±0.28 and 1.25±0.30, 3.55±1.35 and 3.60±1.31, respectively). The RI-SUVmax within normal, benign and malignant structures were: -13%±12%, 2%±10% and 12%±14%, respectively. The SUVmax value cut-off at 60 and 90min p.i. of the 18F-FDG which indicates abnormal glucose metabolism activity was 2.02 and 1.90, respectively. Furthermore, the RI-SUVmax of 5.7% suggests the malignant etiology. The DTP 18F-FDG PET/CT protocol differentiated the normal and abnormal metabolic activity with the sensitivity and specificity up to 100%.

Conclusion:

The DTP 18F-FDG PET/CT protocol might be useful in better prediction of distinguishing normal or pathologic character of lesion in the pharynx.

Preoperative hypofractionated radiotherapy with sequential chemotherapy in primary marginally unresectable or marginally resectable high grade soft tissue sarcomas of extremities or trunk wall: an interim analysis of prospective phase II clinical trial

- **Mateusz Spałek, Hanna Koseła-Paterczyk, Aneta Borkowska, Michał Wągrodzki, Anna Szumera-Ciećkiewicz, Andrzej Cieszanowski, Patrycja Castaneda-Wysocka, Tomasz Świtaj, Monika Dudzisz-Śledź, Anna Czarnecka, Edyta Dąbrowska-Szewczyk, Piotr Rutkowski**
- Department of Radiotherapy I, Maria Sklodowska-Curie Institute - Oncology Center, Warszawa

Background:

There is lack of standard treatment of unresectable and marginally resectable sarcomas (STS). The addition of neoadjuvant/induction chemotherapy before the irradiation and in the prolonged gap between the end of hypofractionated 5x5 Gy radiotherapy and surgery may allow to obtain the R0 resection rate, high pathological response rate and/or a higher rate of limb-sparing/conservative surgery as well as to increase patients\' survival. The study aim was to assess the efficacy and safety of preoperative hypofractionated RT combined with chemotherapy in primary locally advanced STS.

Material/methods:

A single-arm prospective clinical trial was conducted (ClinicalTrials.gov Identifier: NCT03651375). Treatment consisted of one cycle of doxorubicin and ifosfamide (AI), then 5x5 Gy, and two cycles of AI in seven-eight weeks gap between the end of RT and surgery. STS response was assessed in DWI-MRI and pathologically by EORTC STBSG criteria. The primary endpoint is rate of limb-sparing surgeries and R0 resections.

Results:

29 patients(pts) met eligibility criteria, 22 received the whole planned protocol treatment, four are currently receiving the treatment, in three pts the treatment was prematurely stopped. 22 pts underwent limb-sparing or conservative surgery, 3 pts underwent extremity amputation, two after 1st AI cycle due to poor tolerance, one due to extensive tumour invasion without possibility of vessels reconstruction. Among patients who underwent conservative treatment, in 14 of them resection margin was R0, in 7 pts R1. One toxic death occurred outside our centre related to severe bone marrow suppression with septic shock after 2nd AI cycle. Early tolerance of chemotherapy was acceptable. Grade 3+ CTCAE4.03 toxicity occurred in 11 pts. Early RT tolerance was good. EORTC grade 1 radiation dermatitis occurred in 13 and grade 2 in three pts. Postoperative wound complications occurred in 7 pts, in two were severe. Very good pathological response (<1% of stainable tumour cells; grade A/B) was found in 5 pts. Good pathological response (<50% tumour cells; grade C/D) was found in 12 pts.

Conclusion:

Preoperative AI combined with hypofractionated radiotherapy is a feasible method of the management of marginally resectable STS. It provides a good pathological responses in advanced STS with acceptable treatment toxicity.

Impact of diaphragm dome delineation on treatment position of breast cancer patients irradiated in DIBH technique

- **Łukasz Raszewski, Dominika Borowczak, Dorota Galas - Świdurska, Ewelina Konstanty**
- Greater Poland Cancer Centre, Poznan

Background:

Deep Inspiration Breath Hold (DIBH) technique is an acclaimed approach in treatment of left-sided breast cancer aiming in cardiac dose reduction. Position of heart is dependent on combining chest movement due to deep inspiration and diaphragmatic breathing pattern. While chest movement is evaluated directly through Real –Time Position Management (Varian Medical Systems, Palo Alto, CA, USA, RPM) system, the assessment of diaphragm movement and it\'s value is disputable. The aim of study was to evaluate if the diaphragm delineation and it\'s assessment on megavoltage (MV) portal imaging had a significant impact on patient\'s treatment position.

Material/methods:

The study included 21 female patients aged 36 – 78 receiving adjuvant (post breast-conserving surgery or post-mastectomy) radiation therapy due to left-sided breast cancer. Patients qualified to DIBH RPM technique were divided into two groups using the 1:2 proportion: planning CT scans of 7 patients included delineation of left dome of diaphragm according to RTOG atlas, while planning CT scans of 14 patients did not include contouring of diaphragm. Both groups included patients after breast-conserving treatment and mastectomy, the irradiated fields in both groups comprised of tangential fields, with or without nodal fields or post-mastectomy scar and nodal fields. Patients in both groups were treated using treatment 3DCRT or IMRT plans with IMRT SIB techinque for boost, receiving standard fractionation and hypofractionated scheme. At every fraction treatment position was evaluated using kV and MV portal imaging focusing on assessment of Central Lung Distance (CLD), Maximal Heart Distance (MHD) and diaphragm position. The accumulated data included differences between initial position and treatment position at each fraction in vertical, longitude, latitude dimmensions. The data were assesed using t-test and Mann-Whitney U test.

Results:

Difference in longitude dimmension between initial and treatment position is statistically significant when compared between two groups (Mann-Whitney: $p = 0{,}034$; t-test: $p = 0{,}043$).

Conclusion:

Diaphragm delineation and it\'s assessment during treatment has a significant impact on patient\'s position during treatment. Further investigation on larger group is required to ensure delivering the optimal treatment plan with benefit for patient.

Liver exposure to radiation during right breast cancer radiotherapy

- **Urszula Sobocka-Kurdyk**
- Greater Poland Cancer Centre, Poznan

Background:

Liver is not recognized as typical critical structure during breast cancer radiotherapy (BCRT). In the past it was considered as a very fragile organ to irradiation. The main aim of this study was to find out whether the dose delivered during BCRT to the liver is medically significant.

Material/methods:

In this work, radiotherapy treatment plans in 3D-CRT and IMRT techniques for a selected group of patients were created. Fractionation scheme was 25X2Gy. To consider the importance of doses received by the liver during BCRT, it was contoured as an organ at risk. A comparison, based on qualitative analysis of averaged Dose Volume Histograms (DVH) for selected parameters, has been performed: 1. Doses delivered to liver to doses delivered to lungs comparison was created to investigate whether they were relevant during 3D-CRT and IMRT breast cancer radiotherapy. 2. An evaluation of maximum dose delivered was prepared. 3. A correlation between prognostic factors and irradiated volume of liver has been performed.

Results:

1. Comparison between lungs and liver during 3D-CRT breast cancer radiotherapy has shown that dose distributions are comparable (p=0,012). Particular attention should be paid to the fact that 6,44%(3D-CRT) volume of liver received dose above 20 Gy (5,96% for IMRT technique) . The same dose was delivered to 10,31% volume of lungs. 2. During breast cancer radiotherapy averaged maximum dose received by liver was 47 Gy for 3D-CRT and 51,2 Gy for IMRT. 3. Mean liver dose in group of patients was estimated to 4 Gy for 3D-CRT and 9,33 Gy for IMRT. A correlation between mean liver dose and treated volume has been noticed (p=0,37).

Conclusion:

According to QUANTEC normal liver tolerance defined for the primary liver carcinomas radiotherapy are estimated: mean dose <30-32 Gy. Exceed of this limits may cause radiation-induced liver disease (RILD). The dose delivered to liver is surprisingly high in view of the fact that it isn't recognized as a typical critical structure during breast cancer radiotherapy. It is worth to consider placing the liver in a group of organs at risk for right breast radiotherapy.

ABSTRACTS / STRESZCZENIA

Session 2

Development of a preclinical model to investigate radiation effects after proton brain irradiation

- **Suckert Theresa, Johannes Müller, Elke Beyreuther, Antje Dietrich, Cläre Von Neubeck, Armin Lühr, Mechthild Krause**
- OncoRay – National Center for Radiation Research in Oncology, Faculty of Medicine and University Hospital Carl Gustav Carus, Technische Universität Dresden, Helmholtz-Zentrum Dresden – Rossendorf, Germany

Background:

Almost half of all cancer patients receive radiotherapy during their treatment, either alone or in combination with other modalities. While the prescribed dose is conventionally delivered with photons, particle therapy, such as proton therapy, has arisen as alternative. Due to a favorable depth-dose distribution in the patient, tumor surrounding normal tissue is spared thus making this treatment especially valuable for pediatric or brain tumor cases. Nevertheless, because of clinical safety margins and uncertainties about the relative biological effectiveness (RBE) of particle radiation, early or long-term side effects may still occur. A constant RBE of 1.1 is used in the clinics, even though in vitro experiments hint at varying values. Yet in vivo data on proton brain irradiation is still scarce. To tackle the gap, this project aims at establishing a clinically relevant mouse model where only brain subvolumina are treated.

Material/methods:

Experiments were performed at the experimental beam line of the University Proton Therapy Dresden. For beam characterization and dosimetry ionization chambers, a scintillation detector and radiochromic films were applied. A computed tomography and X-rays were used for treatment planning. Mice were accurately positioned relative to the beam by combining the workflow with proton radiographies. After irradiation, brains were excised and analyzed for DNA damage by immunofluorescent staining of gH2AX. An evaluation algorithm was developed for quantification.

Results:

Beam characterization, establishment of the positioning workflow and proton mouse brain irradiation were successfully realized. gH2AX distribution revealed that the beam stopped inside the brain and only a subvolume was affected. The evaluation algorithm proved to be fast and effective and is now used to compare the DNA damage to the dosimetric results.

Conclusion:

Our setup allows the irradiation of mouse brain subvolumina and enables the investigation of further research questions. For RBE studies, the data will be compared to matching photon experiments. Clinically relevant long-term experiments, such as measuring structural anomalies and cognitive functions, are planned to directly relate potential photon and proton side effects in brain radiotherapy.

Influence of chemotherapeutics and irradiation on lncRNAs expression in HNSCC cell lines

- **Kacper Guglas, Tomasz Kolenda, Marcel Ryś, Anna Teresiak, Renata Bliźniak, Izabela Łasińska, Jacek Mackiewicz, Katarzyna Lamperska**
- Laboratory of Cancer Genetic, Greater Poland Cancer Centre, Poznan, Poland 2. Department of Cancer Immunology, Chair of Medical Biotechnology, Poznan University of Medical Sciences, Poznan

Background:

Head and neck squamous cell carcinoma (HNSCC) is the sixth most common cause of cancer mortality in the world. To improve the quality of diagnostics and patients\' treatment efectiveness new biomarkers are needed. Recent studies have shown that different types of long non-coding RNAs (lncRNAs) are dysregulated in HNSCC and correlate with many biological processes. In this study, we examined changes in lncRNAs expression in HNSCC cell lines after chemo- and radiotherapy.

Material/methods:

SCC-40, SCC-25, FaDu and Cal27 cell lines were treated with doxorubicin and cisplatin and different doses of radiation (5, 10, 20 Gy). Effects of cisplatin and doxorubicin were analyzed by MTT test. lncRNAs\' expression after chemo- and radioexposure was studied by qRT-PCR.

Results:

The experiments with radiation showed: 1. Expression profile depended on type of a cell line and dose of radiation. 2. Dose of 5 Gy resulted in dysregulation of Hotair, HOXA3as, SNHG5, Zfhx2as; 10 Gy - CAR Intergenic 10, Dio3os, HAR1A, HAR1B, Zfhx2as; 20 Gy - HOXA6as, PTENP1, Zfhx2as. Common effect of radiation was observed only in Zfhx2as. After cisplatin exposure 14 lncRNAs showed lower expression and only 2 higher. Doxorubicin resulted in lower expression of 8 lncRNAs and increased 4. Common effect of chemotherapeutics was observed in the case of antiPEG11, BACE1AS, PCGEM1 and ST7OT.

Conclusion:

Both chemotherapy and radiotherapy cause changes in lncRNAs expression in HNSCC cell lines. Further study will show if lncRNAs are useful tools in monitoring of patients\' treatment.

Surgical wound fluids collected from breast cancer patients increase migration of cancer cells, however this effect is impaired by intraoperative radiotherapy through radiation-induced bystander effect

- **Igor Piotrowski, Katarzyna Kulcenty, Karolina Zaleska, Mateusz Wichtowski, Joanna Wróblewska, Dawid Murawa, Wiktoria Suchorska**
- Radiobiology Laboratory, Greater Poland Cancer Centre, Poznan, Poland; Department of Electroradiology, Poznan University of Medical Sciences, Poznan

Background:

Breast cancer is the most common cancer occurring in women. Following the breast cancer surgery, over 90% of local recurrences occur in the same quadrant as the primary cancer. Post-surgical accumulation of wound fluid (WF) is a part of post-surgical wound healing response, and is thought to play an important role in growth of cancer cells remaining in tumor bed. Irradiation of the tumor bed is the basis of intraoperative therapy (IORT), in which reduced volume of breast is irradiated with high dose radiation, directly after tumor excision. Although IORT treatment yields good results in comparison with External Beam Radiation Therapy, the mechanism of reduced recurrence risk is not completely understood. There are several reports indicating, that administration of IORT impairs the stimulatory effect of WF on cancer cells. The epithelial-mesenchymal transition (EMT) is a crucial process for migration and invasion of epithelial cancer cells, giving them ability to metastasize. Considering the aforementioned data, we decided to investigate whether WF accumulating after IORT impacts the migratory capacity of breast cancer cell lines. We hypothesized, that cells irradiated during IORT might secrete factors mediating radiation induced bystander effect (RIBE), altering the biological activity of WF and inducing radiobiological response in breast cancer cells.

Material/methods:

We collected conditioned medium from irradiated cells (RIBE) and wound fluids from patients after breast conserving surgery (BCS) alone (WF), and after BCS followed by IORT treatment (RT-WF). We stimulated MCF7 and MDA-MB-468 cells with WF, RT-WF, RIBE or WF+RIBE. First we analyzed the changes in cancer stem cell (CSC) phenotype by flow cytometry. Then, we measured the changes in expression of genes, and the level of proteins related to the EMT process. Finally, we tested the migratory capacity of cells using wound healing assay.

Results:

Our results show that WF stimulates the CSC phenotype and EMT program in both MCF7 and MDA-MB-468 cells. We observed that administration of IORT or addition of RIBE medium partially abrogated this effect.

Conclusion:

We showed that wound fluids increase migration and CSC phenotype in breast cancer cells. This effect was impaired by IORT, through radiation-induced bystander effect.

MRI guided Magneto-Chemotherapy with high magnetic moment nanoparticles for cancer theranostics

- **Nanasaheb Thorat, Joanna Bauer**
- Department of Biomedical Engineering, Wroclaw University of Science and Technology

Background:

Magneto-Chemotherapy (magnetic hyperthermia + chemotherapy), the most recent nanotechnology based revolutionary technique is being proposed in oncology for treating the cancerous tumor, more efficiently. Meanwhile, the development in magnetic nanoparticles (MNPs) based magnetic fluid hyperthermia (MFH) therapy put forth a new window for magneto-chemotherapy. This novel cancer therapy can overcome side effects of currently used radio-chemotherapeutics protocols with maximum therapeutic outcomes. MNPs have intrinsic magnetic resonance imaging (MRI) properties that can further enable image-guided monitoring of drug delivery, visualize drug distribution, assess targeted delivery efficiency, and monitor/trigger drug release/therapeutic process. Thus, the MRI guided magneto-chemotherapy thereby offering the extra advantage of imaging for diagnosis, therapy and therapy monitoring of cancerous tumor.

Material/methods:

A facile low temperature reflux approach for preparing low-Curie-temperature (TC) MNPs such as rare earth-doped iron oxide nanoparticles (IO NPs) conjugated with anticancer drug for targeted Magneto-Chemotherapy coupled with T1–T2 dual-model magnetic resonance (MR) imaging (where T1 and T2 are the longitudinal and transverse relaxation times, respectively) is reported.

Results:

The release of a chemotherapeutic drug from the IO NPs significantly affects cancer cell viability, and the T1–T2 dual-model magnetic resonance enhances bioimaging in a breast cancer cell model.

Conclusion:

We suggest that the chemotherapeutic-drug-conjugated IO NPs have great potential for cell targeting and magnetic resonance imaging in cancer magneto-chemotherapy.

Acknowledgements

The project leading to this work has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 751903.

The Influence of HPV on lncRNA Expression in Head and Neck Squamous Cell Carcinomas

- **Magda Kopczyńska, Tomasz Kolenda, Kacper Guglas, Anna Teresiak, Renata Bliźniak, Izabela Łasińska, Jacek Mackiewicz**
- Greater Poland Cancer Centre, Poznan, Department of Cancer Immunology, Chair of Medical Biotechnology, Poznan University of Medical Sciences, Poznan

Background:

Head and neck squamous cell carcinoma (HNSCC) is a malignancy characterized by high level of patient mortality. Numerous studies show that human papillomavirus (HPV) infection is one of the important risk factors in the progress of the disease. HPV influences the overall expression of many different genes, such as long non-coding RNA molecules (lncRNA). The expression level of lncRNA can be mightily connected with respective clinical parameters and patients\' overall survival. It could serve as a new form of biomarkers. This study is focused on the influence of HPV infection on the expression of long non-coding RNA molecules (lncRNA).

Material/methods:

The TCGA expression data for selected lncRNAs and their targets, as well as clinical data, were downloaded from cBioPortal. The expression levels of lncRNAs were verified according to clinicopathological parameters. The high- and low-expression groups of lncRNAs, as well as disease-free survival (DFS), overall survival (OS) and expression levels of targets\' genes were investigated.

Results:

The expression of lncRNAs CDKN2B-AS1, TTTY14, TTTY15, PRINS, MEG3 and H19 are significantly different among HPV positive and HPV negative patients. Further analyses indicated a few parameters in the HPV positive group which are essentially distinct depending on the expression level of the particular lncRNA: smoking category, gender, N stage, dissection indicator and grade. It was also found that the OS for HPV positive patients with high expressions of PRINS is significantly better in comparison to lower levels.

Conclusion:

Influence of HPV on selected lncRNAs expression was found. More analyses should be done for a better understanding of the connection between HPV infection and HNSCC progression. Areas of interest include the biological function of lncRNAs' targets, as well as the direct effect of HPV oncoproteins on lncRNAs.

ABSTRACTS / STRESZCZENIA

Session 3

Machine specific QA of Multileaf Collimator with Artiscan software

- **Hubert Szweda, Bartosz Pawałowski**
- Greater Poland Cancer Centre, Poznan

Background:

Appropriate quality control of MLC is one of the main part of every quality assurance program. There are two methods of MLC quality control: patient specific QA, assumes that every treatment plan has to be verified before starting the treatment and machine specific QA, assumes that MLC parameters should be check every settled period of time. The main purpose of this work was to perform appropriate tests and protocols used in machine specific quality control of MLC. QA protocols were developed with Artiscan software, used for automatic image analysis, making the QA process faster, and more precisely. Observations of the variation of received parameters allow to set reference values for all MLC parameters and add appropriate tolerances.

Material/methods:

QA tests have been performed on four Varian linear accelerators: Clinac 2300CD-S, Unique, TrueBeam equipped with Millennium 120 Leaf MLC and TrueBeam equipped with High Definition 120 Leaf MLC. Their range included assessment of collimator rotation, leaf positioning accuracy during static fields, dMLC, Static and RapidArc Picket Fence, MLC speed and dose rate/gantry speed tests. Electronic portal imaging devices installed on linacs were used to collect DICOM images. Obtained images evaluated and analyzed in Artiscan software.

Results:

Based on the obtained results and literature sources, the reference values of MLC parameters were determined. For dMLC, MLC speed and dose rate/gantry speed tests appointed 2% tolerance. For the Static and RapidArc Picket Fence 0,7 mm tolerance was suggested, for the accuracy of leafs positioning. For MLC positioning accuracy during static fields determined 1 mm tolerance. Implemented two response levels. First level is activated when the parameter exceeds 80% of the acceptable value and allows to contact with service. Second level is activated after the acceptable value is exceeded.

Conclusion:

Machine specific QA is more sensitive, because it allowed to detect small MLC errors, which haven\'t been detectable in patient specific QA. Developed protocols significantly optimized the quality assurance process, making it faster, more automated and efficient. Protocols are used in clinical routine, assuring that MLC works properly, on all linear accelerators. Two response levels allow for faster service response, before a given parameter reaches unacceptable values.

Comparison of treatment plans created for the linear accelerators with different types of linac head designs

- **Magdalena Charmacińska, Agnieszka Skrobała, Bartosz Pawałowski**
- Greater Poland Cancer Centre, Poznan

Background:

Continuous development of linear accelerators affected that radiotherapy centres have linear accelerators with different types of linac head designs. Moreover, in the daily clinical work the most important is to avoid treatment interruptions because of accelerator's maintenance or failure. To maintain the continuity of radiotherapy, patients could be transferred between the accelerators and sometimes it is necessary to adapt or create the backup treatment plans for the other accelerators. The aim of the study was to investigate the possibility of using VMAT plans on three types of linear accelerators with different types of linac head designs, without the need to create backup treatment plans for other accelerators for four groups of patients with prostate, prostate with lymph nodes, lung, head and neck cancers.

Material/methods:

A literature review was conducted and meetings with the research team to discuss different approaches. In the study was included three medical accelerators: TrueBeam, Clinac 2300CD-S, Unique (Varian). For four groups of 24 patients each with PTV located in 1. lymph nodes, seminal vesicles and prostate; 2. seminal vesicles and prostate; 3. right lung, 4. head and neck organs, origin plan was made for one of the three accelerators and for each origin plan there were created two backup plans for other two accelerators. In the next step plans were compared in terms of the number of monitor units (MU); minimum, maximum, average doses for PTV and selected organs at risk (OARs). Each plan was verified with portal dosimetry using gamma evaluation method (criteria: 3%, 3mm, score 95%). It was done according to the following scheme: origin plan on the origin accelerator, origin plan on the two backup accelerators, two backup plans on the two backup accelerators.

Results:

Differences between the origin and the backup plans in MU, doses for PTV and OARs for each group were below acceptable 2% difference. All origin and backup plans achieved gamma score greater than 95% (clinically acceptable).

Conclusion:

The results of study indicate the possibility of using VMAT plans on the three linear accelerators with different types of linac head designs, without the need of adopting origin plan to backup accelerators, for four group of patients with prostate, prostate with lymph nodes, lung, head and neck cancers.

Analysis of daily portal imaging verification before irradiation process using the DIBH technique in patients with left-sided breast cancer

- **Karolina Byczkowska, Julia Jędrzejewska**
- Greater Poland Cancer Center Poznan

Background:

The aim of the work is to present the method of imaging during irradiation fraction using the DIBH technique. Main purpose: Confirmation that the dose the patient receives will be the same as in the treatment plan.

Material/methods:

The data of 22 patients with left-sided breast cancer treated with the DIBH technique on the Varian Clinac 2300 with the RPM system was used in this study. Patients were divided into two groups in terms of chest volume. In group I there were patients with a chest volume below 15000 cm3, in the second group of patients above that value. KV and MV imaging and beam's eye view imaging during the treatment were used before each fraction of radiation. Beam's eye view images were evaluated in off-line system after each fraction. Verification images were compared with DRR images in three dimentions: vertical, lateral and longitudinal. Breast, chest wall and heart contour were assessed . Each shift greater than 10 mm in the case of kV images and more than 3 mm in the case of MV images resulted in the repositioning of the patient.

Results:

For the whole study group, statistically significant differences were found only when comparing the average weekly shift from the 4rd week of treatment with the third fraction in that week (Vrt p=0,032; Lng p=0,030; Lat p=0,034). However, in 14 patients MV imaging before the start of treatment resulted repositioning in at least once because of too large displacement values or differences in the evaluation of the breast, chest wall or heart contour.

Conclusion:

Due to daily MV imaging before the irradiation process begins, we are always sure that the patient is irradiated properly and the beam's eye view imaging rated off-line confirms

Digital transformation in the evaluation of the image contrast in the quality control of EPID

- **Hubert Stankiewicz, Barbara Drzewiecka, Zbigniew Fojud**
- Department of Medical Physics, Greater Poland Cancer Center, Poznan

Background:

The important element of the EPID functionality is quality control made by different phantoms. Usually the procedure of quality control is done by the acquired phantom's images. Evaluation of their contrast parameter is based on a subjective visual analysis made by human. The aim of the study was to create the self-developed method of evaluation the image contrast parameter during the quality control procedure of EPID using Las Vegas phantom.

Material/methods:

The schema of measurements consisted of two Elekta accelerators (1,2) and two energies of photon beams (6, 15MV), EPID and the phantom - Las Vegas. According to the accelerator vendor's instructions, measurements were performed. Three daily phantom's images were acquired. All images were converted from RGB color model to grayscale in MATLAB. New self-developed method used functionality of the program ImageJ to determine intensity of background (IB) and dark field (IDF) of the Las Vegas phantom images. Intensity was determined by the average intensity of all pixels in the background's region of interest (ROIB) and the dark field's region of interest (ROIDF). Next, according to the following formula: C=(IDF + IB)/IB, the contrast of each dark field on the phantom's image (C) was estimated. During measurements: 93 images (Elekta1, 6MV), 93 images (Elekta1, 15MV), 120 images (Elekta2, 6MV) and 120 images (Elekta2, 15MV) were acquired. The mean value, standard deviation and the coefficient of variation of each dark field contrast were evaluated. The coefficient of variation in the range (0 – 20%) indicated low diversity, (20 – 40%) indicated average diversity.

Results:

Mean value of dark field contrast was in the range of (0.016 – 0.055) for 6MV photon beam, (0.015 – 0.035) 15MV. Standard deviation was in the range of (0.001 – 0.003) 6MV, (0.001– 0.005) 15MV. Coefficient of variation was in the range of (2.20 – 10.27%) 6MV, (3.83 – 28.87%) 15MV.

Conclusion:

Application of ImageJ program supported physicist during evaluation of the EPID's quality control and helped to determine the EPID's parameters. Self-developed method of the evaluation of the phantom's image contrast allow to verify EPID stability for 6MV and 15MV photon beams.

Comparison study of treatment plans for three SBRT techniques: VMAT, IMRT and CyberKnife for low-risk prostate cancer

- **Dorota Borowicz, Agnieszka Skrobała**
- Greater Poland Cancer Centre, Department of Medical Physics, Poznan

Background:

The main purpose of this study was to investigate the basic parameters and DVH for three prostate's SBRT techniques.

Material/methods:

The work consisted of preparing treatment plans for volumetric modulated arc therapy (VMAT), intensity-modulated radiation therapy (IMRT) and CyberKnife for patients with low-risk prostate cancer. A total of 10 patients previously treated with CyberKnife were taken into the experimental cohort. All generated treatment plans provided treatment with 36.25 Gy (7.25 Gy in 5 fractions). VMAT plans were composed of four no-full arcs. IMRT plans were created using 9 coplanar beams. CyberKnife plans were produced using an Iris collimator (in most cases diameter of iris collimator was: 20, 30, 40, 50 mm). Each plan was evaluated based on PTV coverage, conformity index (CI) and homogeneity index (HI). Doses for organs at risk (OARs) and DVH were analyzed.

Results:

No significant difference for PTV coverage was observed: VMAT (97.43%) and IMRT (98.75%) and CyberKnife (95.99%) respectively. Compared to VMAT and IMRT treatment plans, CyberKnife showed a higher total dose in the patient's body. The minimun and maximum dose at PTV: VMAT (34.43Gy, 38.71Gy), IMRT (34.49Gy, 37.59Gy) and CyberKnife (31.65Gy, 46.07Gy). The median of CI: VMAT 1.18, IMRT 1.22, CyberKnife 1.06. The median of HI: VMAT 1.07, IMRT 1.04, CyberKnife 1.27. The percentage of rectum V32.6Gy and V36.25Gy were lower for CK (2.98%, 0.18%), VMAT (4.48%, 0.47%) and IMRT (4.36%, 0.21%). The percentage of bladder V32.6Gy and V36.25Gy: CK (5.20%, 2.51%), VMAT (5.08%, 2.33%) and IMRT (6.64%, 1.22%). The comparison of OARs showed differences between the different types of SBRT techniques.

Conclusion:

This work presented information on three SBRT techniques currently used in the treatment of prostate cancer. Each technique allowed to delivered the prescribed dose to PTV with less or greater saving of critical organs. However, for all technique the OAR's doses were below the tolerances doses. The presented results are a part of the larger project.

Modelling head and neck radiotherapy outcomes using radiomics biomarkers

- **Petros Kalendralis, Zhenwei Shi, Johan Van Soest, Adam Ryczkowski, Andre Dekker, Leonard Wee**
- MAASTRO Clinic & School of Oncology and Developmental Biology (GROW), Maastricht University Medical Centre (MUMC), Maastricht, Netherlands

Background:

Predictive models of radiotherapy (RT) treatment outcomes for head and neck cancer (HNC) patients have clinical value in personalized treatment. Presently, few externally validated models for HNC tumour control and treatment-related toxicity exploit the potential of quantitative image-derived biomarkers (i.e. radiomics) to individually characterize the tumor phenotype. Our primary hypothesis is that adding radiomic features from Planning CT scans improves predictive performance of models for Overall Survival, Xerostomia and Dysphagia, which can be tested by independent external validation between two RT centres.

Material/methods:

A "personal health train" architecture (https://www.youtube.com/watch?v=mktAtHmy-FM) is implemented to connect MAASTRO Clinic (Maastricht, Netherlands) and the Greater Poland Cancer Centre (GPCC-Poznan, Poland). The workflow of PHT is shown in Figure-1. These centres will independently develop and validate multi-variate prediction models on each other's patient data without transferring any subject-level information. This methodology could maximally preserve medical data privacy because no individually-identifiable records are shared among centres. Instead, distributed machine learning algorithms shuttle between data sites to fit statistical models of outcome. The data from the two participated centres consist of retrospective clinical observation records and RT Computed Tomography (CT) planning scans approved for research from the Institutional Review Boards (IRBs) of each centre.

Results:

We aim to have local processing of retrospectively collected clinical and imaging data of H&N patients in combination with the development of a clinical prediction model in Poznan's data preforming distributed validation in MAASTO's dataset. Furthermore, as an extension of our results we are planning to distribute the final fitted models to a third RT centre for fully independent external validation of the models.

Conclusion:

The collaboration between MAASTRO and GPCC will potentially increase the sample size for model development, and provide essential alternative cohorts for fully independent external validation of prediction models. In addition, MAASTRO's technical infrastructure expertise establishes in return a long-term collaboration in Poland aiming to establish an innovative clinical research into the future.

ABSTRACTS / STRESZCZENIA

Poster session

Correlation between the infection of HPV virus and bladder cancer development

- **Maria Malarska, Edyta Borkowska, M Bernat, Magdalena Traczyk-Borszyńska, P Kutwin, Z Jabłonowski, Maciej Borowiec**
- University of Łódź, Departament of Clinical Genetics, Łódź

Background:

Evaluation of the prevalence of HPV in tumor tissue taken during transurethral resection of patients with bladder cancer.

Material/methods:

172 samples were taken from patients at different stages of the disease. 131 of the patients are men 80% of whom are active smokers or quit smoking. The methodology of work was based on DNA isolation (Maxwell RSC DNA FFPE) from fragments of formalin-fixed tissues embedded in paraffin blocks. Thanks to the Real-Time PCR technique, 14 high-risk HPV types were detected: 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68 and a β-globin DNA fragment

Results:

The results showed the presence of human papillomavirus in 7% of patients. The highest oncogenic HPV type, number 16, was observed in 4% of patients. The virus was isolated in G1 (43%) and G2 (57%). Statistical analysis did not show a significant correlation between HPV, sex, smoking, contamination or the degree of cancer.

Conclusion:

Based on the obtained results, the correlation between HPV infection and bladder cancer cannot be confirmed. The fact the high risk genotypes were detected suggests their potential role in the pathogenesis of bladder cancer, however, it is not possible to exclude the participation of other carcinogenic factors in this process (smoking, chemical compounds). A larger number of patients, as well as molecular diagnostics of genetic defects of bladder cancer, would allow more accurate determination of the degree of correlation between the pathogenesis of this cancer and infection with the HPV virus. Research will be continued.

Micro RNA hsa-miR-6510-3p: potential tumor suppressor in head and neck cancer

- **Agnieszka Sobecka**
- Greater Poland Cancer Centre, Poznan

Head and neck squamous cell carcinoma (HNSCC) is the sixth most common cancer worldwide, representing over half a million incidents every year. Currently, the treatment of choice for head and neck cancer is surgery, followed by postoperative chemo- and/or radiotherapy. Despite advances in conventional methods, the 5-year mortality rate of HNSCC patients has not improved. With progress in technologies and molecular genetics, there is a growing potential of gene therapy as a powerful tool for HNSCC treatment. One of the promising therapeutic agents for this approach appear to be small molecules of micro RNA that function as post-transcriptional regulators of genes expression. There is now growing evidence that dysregulation of miRNAs expression may participate in cancer progression.

In our preliminary studies we identified micro RNA hsa-miR-6510-3p, which is nearly 6-fold downregulated in tumor cells compared to healthy tissue. Moreover, our analysis of level3 miRNA-Seq data from 497 HNSCC patients (TCGA HNSC dataset) revealed significant association between hsa-miR-6510-3p downregulation, HNSCC patients' standardized mortality and cancer T stage, suggesting that micro RNA 6510-3p may act as suppressor of head and neck carcinogenesis.

Established HNSCC cell lines (FaDu, H103) were transfected with 20 nM of miR-6510-3p mimic using Lipofectamine RNAiMAX transfection reagent and Opti-MEM medium. Cell proliferation and cell motility were evaluated using MTT assay and wound healing assay respectively. Subsequently, analyses of cell cycle and cell death mechanism were performed with RT qPCR and flow cytometry.

Micro RNA hsa-miR-6510-3p decreases cell proliferation in and inhibits cell migration in FaDu and H103 cell lines compared to control cells transfected with non-specific, random sequence miRNA. Moreover, transfection with miR-6510 led to cell cycle arrest and induction of apoptosis in HNSCC cells.

MicroRNA hsa-miR-6510-3p plays an important role in the carcinogenesis, acting as a potential tumor suppressor in head and neck squamous cell carcinoma.

Thymic tumours: the role of radiotherapy

- **Aleksandra Napieralska, Leszek Miszczyk**
- Radiotherapy Department, Maria Sklodowska-Curie Memorial Cancer Center And Institute of Oncology, Gliwice branch

Background:

An evaluation of the influence of radiotherapy on thymic tumors patient treatment results.

Material/methods:

Study group consisted of 93 patients: 54 female (58%) and 39 male (42%) with median age of 48 years (range: 3-77). Patients were treated in years 1981-2014 due to thymoma in 84 (90%) cases or thymic carcinoma (9 cases, 10%). Masaoka stage was assessed in 93% and 56% of patients were evaluated as stage II, 31% as stage III, and 6% as stage IV. All patients received radiotherapy (RT) as part of the treatment. Among them, 76 patients received adjuvant postoperative RT – in 41 patients after radical and in 35 after incomplete resection. In 17 cases RT was the only definitive treatment, combined in 14 patients with chemotherapy. Patients were irradiated with fraction dose of 1.1-4.0Gy (median 2.0) to the total dose of 20-68Gy (median 49.5). Patient- and treatment-related factors potentially affecting overall survival (OS), progression free survival (PFS) and local control (LC) were evaluated with log-rank test from the date of disease diagnosis. Survival analysis was performed with Kaplan-Meier method.

Results:

During median follow-up of 8.5 years 40 patients died. Median OS was 12 years and 5- and 10-years OS was 64% and 56%, respectively. Median PFS was 8.3 years and 5- and 10-years PFS was 54% and 48%, respectively. Local recurrence was observed in 17 patients. OS was significantly longer in patients with WHO B1 tumor type (p=0.02), in good performance status (PS) (p=0.0005), without radiation-induced pulmonary fibrosis (p=0.02) or second cancer (p=0.03). Difference in OS between patients treated with radical surgery+RT, non-radical surgery+RT and definitive RT was of borderline significance (p=0.065). Factors significantly decreasing LC were: male sex (p=0.04), WHO B2 type (p=0.01), bad PS (p=0.0007), presence of metastases (p=0.003) and second cancer (p=0.03).

Conclusion:

Obtained results do not permit to form robust conclusion concerning role of RT in the management of patient with thymic tumors. Besides clear, unquestionable bad prognostic factors as bad PS, low differentiation, presence of local relapse, lung fibrosis, second malignancy or distant metastases, we found only one more - male sex, decreasing LC.

Considering the Spatial Organisation of DNA to Assess Proton Therapy Relative Biological Effectiveness

- **Natasha Gilmour, Michael Merchant**
- University of Manchester, Manchester

Background:

Increased use of computer simulations in treatment planning for cancer has highlighted the need for more effective methods in modelling nuclear organisation. Current models aim to predict treatment outcomes by simulating the induction of double strand breaks in the DNA of irradiated cells. In proton therapy, this is achieved via use of Geant-4 software, which tracks electron activity after irradiation with a proton beam. Predictive assays can then be used to arrive at a value of the RBE for protons. Currently, the proton RBE value of 1.1 is taken from results in clinical practice, with proton therapy machinery calibrated using depth dose distribution in water for beams of varying energies. It is thought that a more appropriate value could be computed by analysing to what extent proton beams cause chromosome aberrations, a form of genomic reorganisation that indicates damage to the cell nucleus. For this objective to be realised, the geometric organisation of the nucleus needs to be accurately modelled so that it can be integrated with cellular irradiation simulations. This review describes and evaluates some of the modelling approaches for chromosome territories, and aims to recommend a particular approach that research groups involved in proton therapy can use in their work.

Material/methods:

A literature review was conducted and meetings with the research team to discuss different approaches.

Conclusion:

The most recent literature suggests that the concept of more dynamic chromatin fibres is gaining traction, making the loop extrusion model a convincing and exciting approach to simulating the spatial organisation of DNA.

AWARDS / NAGRODY

1st Award:
Mateusz Spałek "Preoperative hypofractionated radiotherapy with sequential chemotherapy in primary marginally unresectable or marginally resectable high grade soft tissue sarcomas of extremities or trunk wall: an interim analysis of prospective phase II clinical trial"
(Centrum Onkologii Warszawa)

2nd Award:
Igor Piotrowski "Surgical wound fluids collected from breast cancer patients increase migration of cancer cells, however this effect is impaired by intraoperative radiotherapy through radiation-induced bystander *effect"*
(Wielkopolskie Centrum Onkologii Poznań)

3rd Award:
Theresa Suckert "Development of a preclinical model to investigate radiation effects after proton brain irradiation"
(OncoRay Dresden)

Best Poster
Agnieszka Sobecka "Micro RNA hsa-miR-6510-3p: potential tumor suppressor in head and neck cancer"
(Wielkopolskie Centrum Onkologii Poznań)

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