ICRP ref: 4852-9144-9932

Third announcement

Joint FMU-ICRP Workshop on Radiological Protection in Medicine

Tuesday, October 3, 2017

Organised by Fukushima Medical University (FMU)
and the International Commission on Radiological Protection (ICRP)
with support from the Nippon Foundation

Simultaneous translation by Hirano Co. Ltd.

Abstracts

FUKUSHIMA MEDICAL UNIVERSITY

ICRP INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

THE NIPPON FOUNDATION
For Social Innovation

Joint FMU-ICRP Workshop on

Radiological Protection in Medicine

Fukushima Medical University

Tuesday, October 3, 2017

Organised by Fukushima Medical University (FMU) and the International Commission on Radiological Protection (ICRP) with support from the Nippon Foundation

Simultaneous translation by Hirano Co. Ltd.

Background

Fukushima Medical University is under development of radiopharmaceuticals for targeted α-particle therapy. Radionuclide therapy combines therapeutic effect of radiation with the targeting capability of molecular therapies and is increasingly being utilised as the result of ongoing development of novel radionuclides and tracer molecules. ICRP Task Group 101 has been working on Radiological Protection in Therapy with Radiopharmaceuticals for providing recommendations related to radiological protection of patients and staff as well as of public. It is important to alert the medical community of optimising therapeutic use and protection required for radiopharmaceuticals, particularly for new treatment procedure such as targeted α-particle therapy. This joint workshop provides an opportunity to exchange information between FMU and ICRP on the advanced scientific findings for the protection of people from the risks of radiation.

Objectives

FMU and ICRP welcome this opportunity to share information on radiation protection in medicine including radionuclide therapy with ICRP Task Group 101 members and medical community.

Venue

Room number 1, the 2nd floor of Bldg. 7, Fukushima Medical University
Access: http://www.fmu.ac.jp/univ/daigaku/campusmap.html

Registration

Attendance at the symposium is free of charge. However, advance registration is required as attendance is limited to 100 participants. Please send your name, affiliation, and e-mail address to Haruyuki Ogino (ICRP Assistant Scientific Secretary) at rpmed@icrp.org by 29 September 2017.

Program

10:30 – 10:40: Opening Address

Koichi Tanigawa
(FMU, Japan)

10:40 – 11:30: Session 1 "*General Overview and Introduction from FMU"*

Radiological Protection in Medicine: Overview and Introduction of TG101

Yoshiharu Yonekura
(QST, Japan)

New Treatment Facility and Targeted Alpha-particle Therapy in FMU

Noboru Oriuchi
(FMU, Japan)

11:30 – 13:00: Lunch

13:00 – 14:00: Session 2 *"Risk Estimate for Radiological Protection"*

Individual Risk Estimates in Radiology: Is it necessary and possible?

Sören Mattsson
(Skåne University Hospital Malmö and Lund University, Sweden)

Pediatric Phantoms for Dosimetry Calculations

Wesley Bolch
(University of Florida, USA)

14:00 – 14:30: Coffee break

14:30 – 15:30: Session 3 *"Radiological Protection in Radionuclide Therapy"*

Individualized Treatment Planning in Radionuclide Therapy

Glenn Flux (Royal Marsden Hospital, UK)

Current Status on Radionuclide Therapy

Makoto Hosono (Kindai University, Japan)

15:30 – 16:30: Panel Discussion

16:30 – 16:40: Closing Remark

Radiological Protection in Medicine:
Overview and Introduction of TG101

Y. Yonekura

National Institutes for Quantum and Radiological Science and Technology, Anagawa 4-9-1, Inage-ku, Chiba 263-8555, Japan; e-mail: yonekura@peach.plala.or.jp

Abstract–Medical exposure of ionizing radiation has grown and expanded rapidly during the past century. It has a unique feature of intentional exposure to provide the clinical benefit, and dose limit is not applied to medical exposure due to the significant benefit received by patients. In order to ensure the proper use of radiation in medical practice, justification and optimization of the radiological procedure should be considered in each patient. Recent progress in radiological technologies has brought various new issues in radiological protection in medicine. The International Commission on Radiological Protection (ICRP) has published various recommendations in radiological protection, and Committee 3 (C3) has been actively involved in radiological protection in medicine, providing practical guidance to the medical community and health care professionals. The use of radiopharmaceutical therapy has a long history, but now attracts much attention for the treatment of malignant tumors with development of novel radiopharmaceuticals. In 2011, ICRP C3 initiated a new working party (WP) on radiological protection in therapy with radiopharmaceuticals. After having intensive discussion among the WP members, we proposed a task group (TG) to complete the document, and TG101 was finally approved in February 2016. In radiation therapy, exposures to the target volume should be individually planned and appropriately verified considering the dose to non-target tissues. We emphasize the important role of individual dose assessment and treatment planning in therapy with radiopharmaceuticals as similar to external radiotherapy.

New Treatment Facility and Targeted Alpha-particle Therapy in FMU

N. Oriuchi

Advanced Clinical Research Center, Fukushima Global Medical Science Center, Fukushima Medical University, Hikarigaoka 1, Fukushima, 960-1295, Japan; e-mail: oriuchi@fmu.ac.jp

Abstract–FMU has been conducting radionuclide therapy in the affiliated hospital, and developing novel radionuclide therapy in Advanced Clinical Research Center. In the new hospital building, we have a radionuclide therapy ward with nine-beds. Radioactive iodine (^{131}I) therapy has been done to treat differentiated thyroid cancer. To fabricate novel radiolabeled compounds for targeted alpha-particle therapy (TAT) is one of the key objectives of our facility. We have succeeded to produce ^{211}At using a cyclotron (MP-30) by vertical beam of alpha particles bombardment to bismuth targets via the ^{209}Bi(α,2n)^{211}At nuclear reaction in reasonable yield and purity for clinical application of TAT. FMU will serve as a center of radionuclide therapy in Japan. To achieve these objectives, research frameworks has been established. Present status and prospect of radionuclide therapy in FMU will be presented.

Individual Risk Estimates in Radiology: Is it necessary and possible?

S. Mattsson[a], M. Andersson[b]

[a] *Medical Radiation Physics Malmö, Lund University, Skåne University Hospital, SE-205 02 Malmö, Sweden; e-mail: soren.mattsson@med.lu.se*
[b] *Medical Radiation Physics Malmö, Lund University, Skåne University Hospital, SE-205 02 Malmö, Sweden; e-mail: martin.andersson@med.lu.se*

Abstract–To inform patients and health-care personnel about risks in diagnostic as well as therapeutic applications of ionizing radiation, it is desirable that the individual patient's radiation dose and potential cancer risk can be prospectively assessed and documented. The current dose and risk reporting is based on effective dose, which ignores body size and does not reflect the strong dependence of risk on the age at exposure. Risk estimations should better be done through individual organ dose assessments, which need careful exposure characterization as well as anatomical description of the individual patient. In nuclear medicine, reference biokinetic models should also be replaced with models describing individual physiological states and biokinetics. There is a need to adjust population-based cancer risk estimates to the possible risk for the individual depending on age and gender. One way to do that is to use the U.S. Environmental Protection Agency (EPA) Lifetime attributable risk (LAR) values. The LAR estimates are based on the same epidemiological data as ICRP uses for the risk coefficients related to effective dose, but differentiate the cancer risk into age and gender specific subgroups and have also a clearly defined detriment in the form of either the excess risk of receiving a cancer or the excess risk to die from the received cancer. The presentation summarizes reasons for individual cancer risk estimates and gives examples of methods and results of such estimates.

Pediatric Phantoms for Dosimetry Calculations

Wesley Bolch

Advanced Laboratory for Radiation Dosimetry Studies, J. Crayton Pruitt Family Department of Biomedical Engineering
University of Florida, Gainesville, Florida 32611-6131, USA; e-mail: wbolch@ufl.edu

Abstract–Medical imaging of the infant, child, and adolescent plays an extremely important role in the overall medical management of this critical component of the medical patient population. The vast majority of medical images are acquired via use of ionizing radiations (photons) and thus careful optimization of patient radiation dose and image quality must be undertaken. Organ doses from medical imaging of the pediatric patient population are difficult to ascertain via experimental measurement, and thus one typically employs computational anatomic models coupled to Monte Carlo radiation transport simulations. In this present, we will review the development of reference phantoms for the ICRP pediatric series – newborn, 1-year-old, 5-year-old, 10-year-old, and 15-year-old male and female, as well as series of pregnant female models. We will also review the use of phantom libraries that cover a broad range patient body morphometries such as those of the UF/NCI phantom series, which permit more detailed and patient-specific estimates of organ dose. The presentation will review techniques for organ dose assessment in three key areas of medical imaging – computed tomography, fluoroscopy (both diagnostic and interventional), and nuclear medical. We will discuss various studies which seek to quantity the accuracy by which reference phantoms and phantom libraries can provide patient-specific values of internal organ dose.

Individualised Treatment Planning in Radionuclide Therapy

G.D. Flux

Joint Department of Physics, Royal Marsden Hospital & Institute of Cancer Research, Sutton, Surrey SM2 5PT, UK;
e-mail: Glenn.Flux@icr.ac.uk

Abstract–Radionuclide therapy has been used for the treatment of malignant disease for over 70 years. In recent years the combination of a range of novel radiotherapeutics, in conjunction with new methodological and technical developments, have led to rapid developments and promising treatment options for common, as well as for rare cancers. In the forefront of current developments is the gradual shift from regarding radionuclide therapy as 'radioactive chemotherapy', whereby administrations are governed by fixed levels of activity, possibly modified by body mass or surface area, to a form of radiotherapy, with the recognition that treatment outcome is dependent on the absorbed doses delivered to target volumes, taking into account the absorbed doses delivered to organs at risk. It has been clearly demonstrated that the former approach leads to a wide variation in inter-patient dosimetry so that personalised, dosimetry-based treatment planning offers the potential to deliver, for the majority of patients, higher tumour absorbed doses that can lead to significant improvements in treatment response and overall survival. This presentation will review current developments in dosimetry, particularly as applied to radioiodine treatment for thyroid cancer, I-131 mIBG for neuroblastoma and Ra-223 for bone metastases from prostate cancer and will consider the impact on clinical and cost-effectiveness resulting from these ongoing developments.

Current Status on Radionuclide Therapy

M. Hosono

Department of Radiology & Institute of Advanced Clinical Medicine, Faculty of Medicine, Kindai University, Osaka-Sayama, Osaka, 589-8511, Japan; e-mail: hosono@med.kindai.ac.jp

Abstract–Since 1940s I-131 has effectively been applied to hyperthyroidism and metastatic differentiated thyroid cancer as one of the most representative pharmaceuticals for Radionuclide Therapy (RNT). Nowadays RNT is an important treatment option alongside surgery, chemotherapy, and external beam radiation therapy in the management of malignancies, whether curative or palliative. RNT is principally based on the use of molecules that have high-affinity and specificity to tumors as carriers of radionuclides, and thus it has the character of being an efficacious molecular targeting method as well as radiation therapeutics. Although RNT has been well established in some malignancies, it has not demonstrated yet sufficient therapeutic efficacy in others. Recently novel pharmaceuticals and radionuclides have been developed and clinically introduced, which are expanding the application of RNT to a wide range of malignancies. Lu-177 somatostatin receptor ligand therapy has proven to improve survival in patients with neuroendocrine tumors and Ra-223 dichloride has been approved for the treatment of prostate cancer with bone metastasis. Ra-223 is the first alpha-emitter that has obtained drug approval, which substantially encourages the research and development of targeted alpha therapy. This presentation will discuss how we should present radiological protection guidelines to respond and facilitate new technologies of RNT.