South Asia Centre for Medical Physics and Cancer Research

SCMPCR
Newsletter

A Project of Alo-BT

January 2022 | Volume 4 | Issue 1

MOTTO: Quality Education and Health Science for Patient Benefit

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Chairman's Message

The year 2021 is another year of the corona pandemic. We now have two variations of corona called Delta and Omicron. The Omicron variant is spreading faster than its predecessor Delta variant. This is not a good development for us. But what is important is that this year we have also found vaccines against all these pandemics, and drugs will follow suit. There is excellent hope for all of us. We should believe in the potential of science and research. The only question is how we can use the results of research for all of humanity. The greatest challenge, soon to vaccinate everyone in the world. If one corona patient is left, there is still a danger to humanity.

Now I would like to draw your attention to some important publications. In December 2021, the IAEA published the document TCS-56 (Rev.1), an update of the Training Course Series No. 56 (TCS-56) of 2013 that includes newer core resources and clarifications on student admission and assessment, and quality management to promote best practices and program sustainability. The IAEA also released this year the guidelines on certification of clinically qualified medical physicists (TCS-71) endorsed by IOMP and IMPCB to promote the profession's recognition further. Other important documents that have already been published are the three publications of the training course series, which provide guidelines and references for clinical training programs for medical physicists specializing in radiation oncology (TCS-37), diagnostic radiology (TCS-47) and nuclear medicine (TCS-50). These documents are important guidelines for medical physicists in shaping education, training, and professional development in medical physics.

Thank you all, especially the editor-in-chief, editors, board members, staff of SCMPCR, authors and all the wishes of SCMPCR, who supported us in the publication of this wonderful edition. I wish you all a Happy, Healthy and Peaceful New Year 2022.

Prof. Dr. Golam Abu Zakaria
Chairman, SCMPCR

Editor's Notes

It is my great pleasure and privilege to contribute to this first issue of the Volume 4. In this issue, we share recent SCMPCR highlights including AOCMP report, SCMPCR E-Learning activities, general articles, scientific articles and news & events from the south asian region.

We also encourage you to start a dialogue with us and provide your feedback and suggestions about how our newsletter can be improved. Also please send us your contribution on or before May 2022 for the next issue which will be published in July 2022.

Thanks
Jeyasingam Jeyasugiththan
Editor-in-Chief

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SUBMISSION DEADLINE FOR NEXT ISSUE: May 31, 2022

The Bangladesh Medical Physics Society (BMPS) hosted the 21st Asia Oceania Congress of Medical Physics (AOCMP-2021) held at the United International University (UIU), Dhaka, Bangladesh, from the 10th to12th December 2021. The co-organizers were the Bangladesh Atomic Energy Commission (BAEC), National Institute of Cancer Research and Hospital (NICRH), United International University (UIU) and South Asia Centre for Medical Physics and Cancer Research (SCMPCR). The congress was endorsed by the International Organisation for Medical Physics (IOMP), the Middle East Federation of Medical Physics (MEFOMP), and the European Federation of Organisations for Medical Physics (EFOMP).

It was the first time Bangladesh organised the AFOMP congress provided a perfect forum to fulfil the objective 'fostering knowledge upgradation and encouraging the exchange of ideas'. The comprehensive scientific program was divided into Oration Lectures, plenary sessions, scientific sessions, special ceremonies, sponsor presentations, mini-symposium sessions, poster sessions, an award ceremony and the valedictory session. Three hundred sixty participants attended from 28 different countries in Asia-Oceania, Europe, the Middle East and the US. Many companies arranged exhibition stands at AOCMP-2021, thus allowing the participants to see the latest development in the medical physics industry. The sponsors and exhibitors at AOCMP-2021 were: Varian Medical System, Team Best, Siemens Healthcare, Elekta, PTW, United International University (UIU), Labaid Cancer Hospital and Super Speciality Center, Oregon, Vision RT, LAP, RTI, ZEISS, PICO. We express sincere gratitude to all sponsors and exhibitors.

Special Ceremony

The special ceremony was glorified with the presence of Mr. Ziaul Hasan, NDC (Chief Guest), Secretary, Ministry of Science and Technology, People's Republic of Bangladesh; Professor Dr. Sanowar Hossain (Special Guest), Chairman, Bangladesh Atomic Energy Commission (BAEC); Professor Dr. A. K. H. Enayet Hussain (Special Guest), Director General, Medical Education, Ministry of Health and Family Welfare, People's Republic of Bangladesh; Dr. Kazi Anowarul Hoque (Special Guest), Additional Secretary (PRL), Local Government Division, Ministry of Local Government, Rural Development & Cooperatives, Bangladesh; Prof. Dr. M Iqbal Arslan (Special Guest), President, Swadhinata Chikitshak Parishad (SWACHIP); Prof. Dr. Chowdhury Mofizur Rahman (Patron), Vice-Chancellor, United International University; Mr. Anwarul Islam, President, BMPS; Prof. Dr. Hasin Anupama Azhari, Organizing Chairperson, AOCMP-2021 were present personally whereas Prof. Dr. Arun Chougule (India), President, AFOMP; Prof. Dr. Eva Bezak (Australia), Vice President, AFOMP in online. The session was presided over by Professor Dr. Golam Abu Zakaria, Patron, Organizing

AOCMP-2021

Committee, AOCMP-2021. The ceremony was also gratified with valuable speeches on medical physics, where the experts shared their experiences with scientists and helped the medical physics community through collaborative work.

Scientific Session

The scientific session included Kiyonari Inamura Oration Lecture, Keynote Lectures (6), Invited Lectures (26), sponsor presentations (06), Mini-Symposium (5), Oral (92) and e-poster presentations (64). New research and innovations in different areas such as radiation oncology, radiation protection, treatment planning systems, dosimetry, brachytherapy, radiology, molecular imaging, nuclear medicine, imaging, and advanced biomedical engineering were presented by local and foreign presenters during this program.

Vendors' Presentation

Six vendors presented their papers on modern and updated medical physics technology from Varian Medical Systems, Team Best, Elekta, PTW, Carl Zeiss, LAP.

Award Ceremony

The three best papers out of the 92 oral presentations were selected for the award ceremony by a judging panel from the radiotherapy session and the radiology and imaging session based on the evaluation criteria. Further, the three best poster presentations out of 64 e-posters in radiotherapy, radiology and imaging, and nuclear medicine were selected.

Mode of Congress

The congress was conducted virtually, and eminent professionals chaired each session. The presenters were allowed to present over recordings or live. The presenters were presented in every session to answer the questions raised by the audience.

Closing Ceremony

AFOMP President, Vice-President, Secretary General and Organizing Secretary shared their experiences about the arrangement of this international program for the inspiring young generation.

Acknowledgement

We are thankful to all BMPS and SCMPCR members, local and foreign participants, colleagues, contributors, organising committee members, co-organisers, sponsors, scientists, researchers, students, and all others for their support at the AOCMP-2021. We are especially thankful to the Design Accent team who supported the AOCMP-2021 virtual platform.

AOCMP-2021: AFOMP award winners

Best Paper Award	Yoshiro Leko (Japan)
C. V. Saraswathi – A.N. Parameswaran Memorial AFOMP Best PhD Award	Wonjoong Cheon (Korea)
Young Acheiver Award	Ying Song (China)
Prof. Sung Sil Chu's AFOMP Best Student Publication Award	Hemalatha Athiyaman (India)

AOCMP-2021: Best oral presentation award winners

Position	Radiotherapy	Radiology and Imaging
1st	**Mohammad Amin Mosleh-Shirazi** Influence of Post-synthesis and Post-irradiation Times on Dosimetric Properties of a VIPET-type Gel Dosimeter	**Susmita Afroz** Cluster Size Analyses of ALPIDE-CMOS Pixel Sensor for pCT
2nd	**Abdul Sattar Khalid** A Retrospective Study on The Dosimetric Effect of Not Applying A Shift in Varian Ring Applicators For HDR Cervix Brachytherapy Treatments	**Kuratani Yosuke** Translation from Non-Contrast to Contrast Images by Cycle-GAN in Head-Neck Vascular CT Imaging
3rd	**Miriam Eckl** Dosimetric Benefits of Daily Treatment Plan Adaptation for Prostate Cancer Stereotactic Body Radiotherapy Based on Synthetic Cone-Beam CT	**Katsumi Tsujioka** Image quality evaluation on-center and off-center FOV of CT (Spatial resolution and motion artifacts)
	Nur Asilah Jalalludin Photon Beam Commissioning of Elekta Versa HD Linear Accelerator: A Multi-Institutional Study	

AOCMP-2021: Best poster presentation award

Position	Radiotherapy	Radiology & Imaging	Nuclear Medicine
1st	**Kalyan Mondal** Plan Quality Score To Evaluate The Impact Of Dtdc On Ipsa Optimized Treatment Plans Of Mupit Based Interstitial Brachytherapy In Cervical Cancer	**Urshella Hishaam** Optimizing Image Noise as a means to Improve Computed Tomography ATCM in Sri Lanka	**Dr. Chai Hong Yeong** Medical Imaging Capabilities of Neutron-Activated Samarium-153 Polystyrene Microspheres As A Theranostics Agent After Direct Intra-Tumoural Injection On Sprague-Dawley Rats With Xeno transplanted Liver Tumours
2nd	**Cheung Ho Yin Anson** Dosimetric Evaluation of Helical Tomotherapy (HT) versus Volumetric Arc Therapy (VMAT) in Patients with Liver Radiotherapy Treatment	**Dr. Bijan Hashemi** Assessment of Abdomen-Pelvis CT Protocols Based on Doses for Various Patient Sizes using Anthropomorphic (XCAT) Phantoms and Monte Carlo Simulation	**Cheung Ho Yin Anson** Respiratory gated (4D) FDG-PET/CT scan for liver malignancies: Feasibility in liver cancer patient and tumour quantitative analysis
3rd	**Sathiyaraj** Validation of non-coplanar dosimetry of SRS/SRT using Octavius 4d dosimetry system	**Akyea-Larbi Kofi Okyere** Benchmarking of a New Automatic CT Radiation Dose Calculator	**Shinji Kawamura** Study on the evaluation method of 125I source strength inserted in a sterilized cartridge

A Small Initiative to Address Large Deficit: Boosting the Medical Physics Expertise in Diagnostic Radiology Through Accredited E-Learning Program

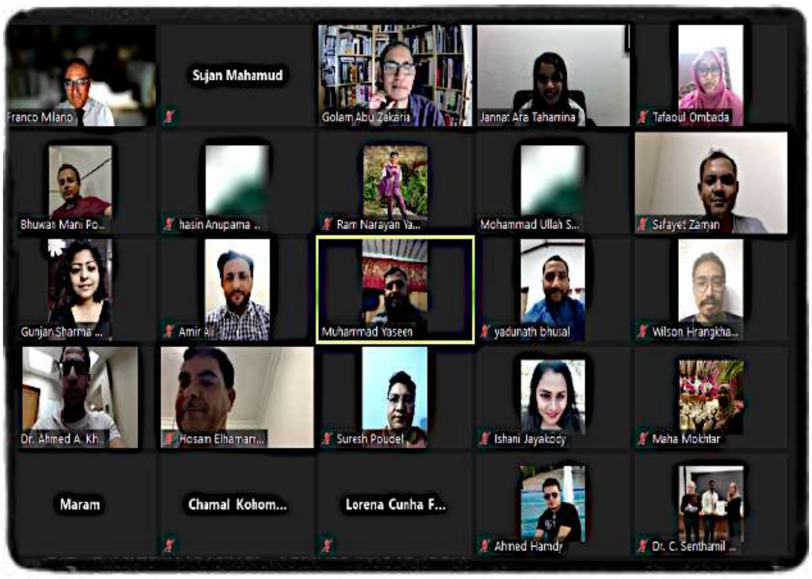
Mohammad Ullah Shemanto
Program Manager
South Asia Centre for Medical Physics and Cancer Research (SCMPCR),
Dhaka, Bangladesh

The well-being of people is an anchor point for humanities. When we are sick or injured, we go to a doctor who may recommend various tests to create images of various body sections, depending on the type of sickness, symptoms, or injury. These tests can assist in diagnosing the likely source of present symptoms and test for possible health issues before symptoms arise. X-ray, fluoroscopy, CT, MRI, ultrasound, interventional radiology and other scans allow doctors to diagnose and track the effectiveness of treatments and make adjustments as needed.

Globally, medical imaging has helped diagnose several diseases more effectively and efficiently in the modern era. Worldwide, an estimated 3.6 billion radiology, dental radiography, and nuclear medicine examinations are performed annually among 6.4 billion persons. Although, the World Health Organisation stated that approximately two-thirds of the world's population lacks adequate access to medical imaging. The scarcity of imaging services in developing regions contributes to a widening health care disparity and limits global public health programs that require imaging. Access to diagnostic imaging services significantly impacts public health and can potentially reduce infant mortality, increase detection of some types of cancer at an early stage, and many other such benefits. Unfortunately, current shortages of human resources and obsolete or broken equipment make it increasingly challenging to provide adequate access and quality in our region.

Medical physicists have a significant contribution to patient safety and effective disease diagnosis. It is well known that medical exposure procedures such as diagnostic radiology, nuclear medicine and radiotherapy remain the largest source of artificial ionising radiation exposure and continue to grow substantially. While the shortage of Diagnostic Radiology Medical Physicists is a global problem, it is most acute in developing countries.

Medical physicists performing diagnostic clinical activities are typically responsible for a large number and wide variety of imaging equipment. Although diagnostic radiology is a vast field for medical physicists, there are far fewer



diagnostic physicists than therapeutic physicists, especially in the South Asian region.

For example, 160 million people need to be diagnosed at various times in Bangladesh, while only cancer patients require radiotherapy treatment. Prof. Zakaria initiated the medical physicists' education and training in Bangladesh in 1990, and currently, there are about 40 radiation oncology physicists involved in radiotherapy services in most cancer hospitals. Unfortunately, neither the policymakers nor the hospital authorities know the importance of medical physicists in diagnostic radiology. Appropriate steps need to make by policymakers to understand the importance of medical physicists in diagnostic radiology. Further, the importance of training and education by skilled trainers for developing this field is immense. To address these issues and provide adequate practical and theoretical knowledge on different diagnostic modalities, quality control and safety aspects, SCMPCR arranged its fourth e-learning program titled SCMPCR E-learning Program (ELP-04): Quality Control in Medical Imaging. This course included a series of lectures on the specific discipline of Diagnostic Radiology, group discussions, and online examinations from 4th to 25th June 2021. Experienced International trainers conducted all lectures in this program.

Selection of Candidates: Because of the overwhelming response received worldwide and a massive number of requests, only 85 participants out of the 210 applicants from 29 countries were selected. Priority was given to the radiologists, technicians, and medical physicists involved in diagnostic radiology, Freshers in diagnostic radiology and medical physics, Researchers working in diagnostic radiology physics, and students interested in the diagnostic Radiology fields to boost their career path and enrich their knowledge.

Accreditation: This course was accredited by EBAMP as a CPD event for Medical Physicists at EQF Level 7, and 32 CPD credit points were awarded to participants (24 CPD credit points for those who do not sit for or do not pass the examination).

Lecture-1: The course was inaugurated by Prof. Dr. Golam Abu Zakaria after his welcome speech. The first lecture of this series was held at 2:30 PM (GMT) on 4th June 2021. The topic was 'Introduction of Diagnostic Radiology and the Role of Medical Physicists' by Prof. Franco Milano. Prof. Milano is a Senior Physicist at Florence University Hospital and a Medical Physics Professor at the University of Florence, Italy. The program was moderated by Ms Gunjan Sharma, Medical Physicist, Govt. Medical College, Amritsar, Punjab, India.

After a 1 hr lecture session, 15 minutes were allocated for answering the participants' questions. After each session, all study materials related to the lecture and the lecture recording were shared with the participants to assist with examination preparation.

Lecture-2: At the second lecture on 5th June 2021, Prof. Franco Milano emphasised the 'IAEA Guidance on Quality Assurance and Safety. The session

SCMPCR E-Learning

was moderated by Ms Jannat Ara Tahamina, Trainee Documentation Officer, SCMPCR.

Lecture-3: The third lecture of this series was held on 6th June 2021. The topic of this lecture was 'Dose Matrix in Diagnostic Radiology; Calibration and Verification of Dose Data delivered by Dipl.-Ing' by Kathrin Entz, Medical Physics Expert, from the University Hospital Frankfurt, Germany. The session was moderated by Mrs. Ishani Anushika Jayakody, Postgraduate student, MSc in Medical Physics, University of Colombo, Sri Lanka.

Lecture-4: On the 11th June 2021 Ms Jannat Ara Tahamina moderated the fourth session of the series on 'QC in Mammography, CR, DR and X-Ray', which was delivered by Dr. Stephan Garbe from the Clinic for Diagnostic and Interventional Radiology, University Hospital Bonn, Bonn, Germany.

Lecture-5: The fifth lecture of this series was held on 12th June 2021. On this day, Dr. Eslam Kamal, Medical Physics Consultant at the Nuclear Medicine and Molecular Imaging Dept, Burjeel Medical City, Abu Dhabi, United Arab Emirates, delivered his lecture on CT Physics Technology Image Quality in CT'. The session was moderated by Mr. Saad Bin Saeed Ahmed, a Medical Physicist from the Aga Khan University Hospital, Karachi, Pakistan.

Lecture-6: On 13th June 2021, Dr. Stephan Garbe delivered the sixth lecture on 'QC in Interventional Radiology', and Mrs. Ishani Anushika Jayakody moderated the session.

Lecture-7: The seventh lecture of the course was held on 18th June 2021. Dr. Eslam Kamal delivered his lecture on 'CT Dosimetry and Reconstruction Algorithms' with the moderation of Ms. Jannat Ara Tahamina.

Lecture-8: On 19th June 2021, the eighth lecture of this series was given by Prof. Dr. Liu Ho-Ling Anthony, the Director of Imaging Physics Residency Program in the Department of Imaging Physics, MD Anderson Cancer Center, University of Texas, Houston, Texas, USA. Prof. Dr. Liu Ho-Ling Anthony briefly discussed 'MRI Quality Control and Image Quality Management'. Ms. Gunjan Sharma moderated the session.

Group Discussion: Following the course's lectures, there was a group discussion session in which all of the speakers were present and answered questions from the audience. In the chatbox, participants wrote their questions from previous lectures. The moderator channelized the participants' questions to the appropriate speakers. It took place on 20th June 2021. This session was moderated by Dr. J. Jeyasugiththan, a Senior Lecturer of the Department of Nuclear Science, University of Colombo, Sri Lanka. The session was concluded with a vote of thanks by Prof. Hasin Anupama Azhari, CEO, SCMPCR. All the speakers wished the participants good luck for the examination. After the Group Discussion, there were five days of self-study for the participants.

Online Examination: On June 25, 2021, the online examination was held using the class marker online examination platform. Twenty-five MCQ questions were collected from the speakers, and 55 participants attended the examination. The participants who passed the examination were awarded 32 CPD credit points and 24 CPD credit points for those who did not sit for or did not pass the examination.

The fourth e-learning program was another successful event of SCMPCR, and it was made possible by the tremendous effort and cooperation extended by all the speakers, moderators and participants. The participants were satisfied and provided positive feedback that motivated us to conduct a similar program. Further, the SCMPCR authority was delighted with participants' responses and is eager to bring such initiatives more frequently. Overall, the program was very fruitful for medical physicists and students adopting knowledge and skills from experts.

SCMPCR E-Learning

Congratulations ! Prof. Dr. Golam Abu Zakaria for being honored as Fellow of IOMP (FIOMP)

We are happy to announce that the founder chairman of SCMPCR Prof. Dr. Golam Abu Zakaria has been honoured by the International Organisation for Medical Physics (IOMP) as IOMP Fellow for his outstanding contribution to medical physics development.

In 2013, IOMP created the Fellow of IOMP (FIOMP) award to recognise special achievements in the international development of medical physics. The IOMP is honouring his commitment to the international exchange and cooperation between medical physicists from Germany and Bangladesh and his commitment to the expansion of structures in medical physics to improve the health system in Asian and African countries. The German Society for Medical Physics (DGMP) has proposed Prof. Dr. Golam Abu Zakaria name for the Fellow of IMOP award in 2021.

The entire SCMPCR team congratulates Prof. Dr. Golam Abu Zakaria for being honoured as the Fellow of the International Organization for Medical Physics (FIOMP).

SCMPCR E-Learning Program 05 - An Accredited Course on Advanced Radiotherapy: My views & experience

Ms. Jeevangshu Jain
Medical Physicist
ACTREC, Tata Memorial Center,
Mumbai, India

Sometime in early September 2021, I received an email from Shemanto about the 5th e-Learning program of SCMPCR, inquiring if I could moderate any of the sessions; and what else could I say but yes!!

My first interaction with SCMPCR and the team goes back to 2019 when I went to Bangladesh to attend the 5th Hands-on Training & Workshop on 'Dosimetry of Small Fields in External Beam Therapy' and the association has continued to only growing stronger with time, up to date.

The South Asia Centre for Medical Physics and Cancer Research, incepted in 2018, is a project of the Alo Bhubon Trust which aims to create skilled manpower for cancer treatment through different programs using a national and international collaborative approach. SCMPCR organises meetings, seminars, workshops, hands on training, in-service training, e-learning, and awareness programs with national and international experts. Events are for the masses as well as for specific people from different fields in the health sectors for different communicable and non-communicable diseases, especially cancer patients. SCMPCR aims to achieve SDG-goal 3 (Good Health & Well-being) and SDG-goal 4 (Quality Education). It is the passion that Prof. Golam Abu Zakaria Sir has towards SCMPCR that inspires me so much and has kept me connected with the organisation. The efforts of Zakaria Sir, Anupama Azhari Ma'am and the SCMPCR team to nurture the medical physicists in the South Asian region and the African region is unparalleled and a great motivation for us all.

The philosophy of SCMPCR resonates quite a lot with my idea of developing into a responsible medical physicist, so to be a part of any of its programs is a great opportunity for me to learn and grow. The themes chosen for all the SCMPCR programs are relevant to the contemporary needs of the medical physics community and its transforming role in the future.

I remember that the first e-learning program held in June-July 2020 was about revisiting the basics of radiation therapy, radiation protection and imaging. Now, the 5th edition of the e-learning program dealt with the advances in radiation therapy, showing the perceptivity with which these programs are curated. The ELPs which started during the pandemic have now become a regular feature of SCMPCR and is one of the most sought after programs by young medical physicists across the globe.

The 5th ELP, held from 1st October 2021 to 22nd October 2021, on the theme of

'Advanced Techniques in Radiotherapy' was another successful event of SCMPCR with over 50 participants from 28 countries attending. It was a series of 8 lectures and a group discussion, followed by an online evaluation test which was accredited with 18 CDP points by IOMP.

It was a great pleasure for me to be a part of this ELP, moderating some of the sessions and attending the others with each session being educational and informative. I got the opportunity to learn from the experts in medical physics and a chance to get to know and interact with so many fellow medical physicists.

The first session on 1st October 2021 was an 'Introduction to Advanced Techniques from inter and intra fraction motion direction' which was delivered by Dipl. Ing. Volker Steil who is the Head of the Medical Physics and Radiation Protection department at Mannheim University Hospital GmBH, Germany. The moderator for the session, Mr. Suresh Poudel, Medical Physicist at BPKMCH, Chitwan, Nepal started the program with an introduction to SCMPCR, its programs, and their need in the current times.

The next two sessions were moderated by Ms. Mandvi Dixit, a friend of mine, currently working as RSO at Shree Jagannath Charitable Cancer Hospital, NCR, India. The second session on 2nd October 2021, delivered by Dr. Pietro Mancosu, a renowned medical physicist from Humanitas Clinical and Research Hospital-IRCCS, Milan, Italy, was on 'Stereotactic Body Radiation Therapy (SBRT): A New standard'.

On 3rd October 2021, the third session on 'MRI Guided RT' dealt with one of the most sought after technologies in the current times. The lecture was given by Prof. Dr. Rer. Nat. Oliver Jäkel who is the Head of Division of Medical Physics in Radiation Oncology at German Cancer Research Center (DKFZZ), Heidelberg, Germany.

On the 8th October 2021, Mr. Suresh Poudel moderated the 4th session of the ELP on 'IMRT & VMAT' which was delivered by Dr. Dipl.-Ing. Natasa Milickovic, the Head of the Department of Medical Physics and Engineering at Sana Klinikum Offenbach GmbH in Germany.

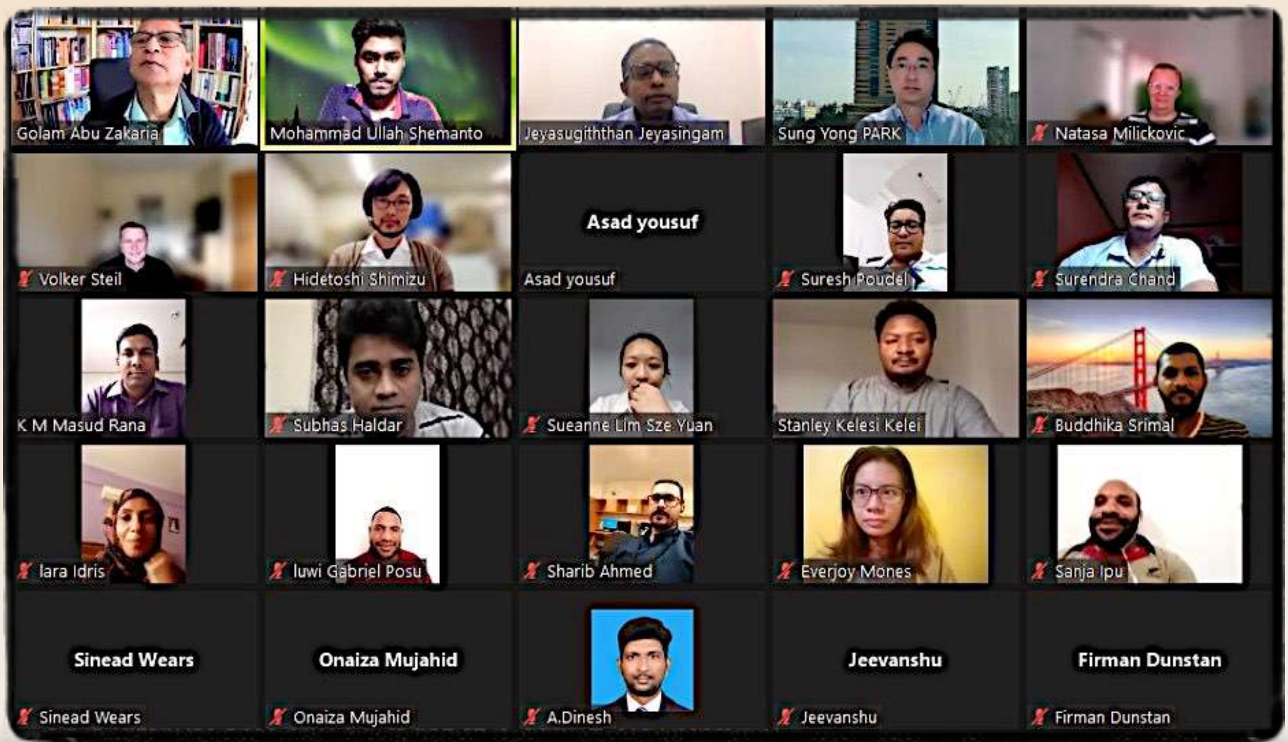
The 5th and 6th sessions were held on 9th and 10th October 2021 respectively and Mr. K. M. Masud Rana, Medical Physicist & RCO at Evercare Hospital, Dhaka, Bangladesh moderated these sessions.

The lecture on 'Tomotherapy: Key Concept, Clinical Adaptation and Recent research regarding the Treatment Planning' was delivered by Dr. Hidetoshi Shimizu, who is the Chief Medical Physicist at Aichi Cancer Center Hospital, Japan.

Prof. Sung Yong Park, who is the Chief Proton Physicist at National Cancer Centre, Singapore, delivered a very insightful talk on the 'Recent Advances in Proton Beam Therapy'.

I got the opportunity to host the last two sessions of the ELP on 15th and 16th October 2021 which were delivered by Dr. Leonard Wee who is an Assistant Professor of Clinical Data Science at MAASTRO, University Maastricht and GROW School of Oncology and MUMC, The Netherlands. The themes of these sessions were very interesting as they dealt with artificial intelligence and imaging modalities. The session on 'Artificial Intelligence, Deep Learning and Machine Learning in Radiotherapy' was very lucidly explained by Dr. Wee as he explained the basics of the artificial intelligence and neural networks.

The session on 'Imaging Modalities used in the Advanced Techniques of Radiotherapy' was also a very interesting



one as we touched upon the concepts of imaging and moved on to the higher dimensions in imaging like radiomics.

The last interactive session of the 5th ELP was the group discussion held on 17th October 2021 which was conducted by Dr. J. Jeyasingham, a senior lecturer in Medical Physics at the University of Colombo, Sri Lanka. The panellist comprised of all the speakers of the 5th ELP and Prof. Zakaria Sir. It was a very interactive session where in depth discussions on the changing role of medical physicists were conducted and the participants got an opportunity to clarify their doubts and ask all the relevant questions.

The assessment examination was conducted on the 22nd October 2021 for the CDP points. 36 participants took the exam, and 80% of the participants obtained a passing grade. Yernar Orda & Tanzhas Shayakhmetov from Hospital Complex of Tomotherapy & Nuclear Medicine UMIT, Kazakhstan scored the highest and passed with 83.3% marks.

The 5th ELP was a great success owing to the cohesive efforts of all the speakers, participants, and the organisers and it is reflected in the feedback we got from the participants. I would like to quote one of the participants, Mr. Luwis Gabriel, a Medical Physics M.Sc. student at the University of Colombo, who appreciated the ELP and the platform that SCMPCR provides for students. Mr. Gabriel said, "At the end of this year 2021, I will be completing my M.Sc. program and be the first Papua New Guinea Medical Physicist. The talks include many clinical and scientific lectures and I am glad to have learnt so much from the SCMPCR platform while being a student at the University. It has expanded my knowledge capacity to a level so as to serve my country in cancer treatment."

It is so heart-warming to see such appreciation and results for the efforts one puts in and the SCMPCR team should be lauded for the same. I thoroughly enjoyed being a part of the 5th ELP, learnt a lot and will look forward to be a part in the future endeavours too. I thank Prof. Zakaria Sir & Prof. Anupama Azhari Ma'am for showing the confidence in young medical physicists like me, and giving us a platform to interact with the experts in the field and our peers. For making this journey smooth for us, I would also like to thank Shemanto, who is another a friend, and the entire SCMPCR team.

See you all soon!!

Addressing October Breast Cancer Awareness Month by Stimulating Knowledge, Attitudes, and Practices About Breast Cancer within the Women's of an Urban Colony

Mohammad Ullah Shemanto
Program Manager
South Asia Centre for Medical Physics and Cancer Research (SCMPCR), Dhaka, Bangladesh

In Bangladesh, the breast cancer incidence rate is estimated to be 22.5 per 100,000 females of all ages, compared to 124.8 per 100,000 females worldwide. Awareness of prevention, early detection and screening are necessary to reduce premature mortality from breast cancer, the leading cause of death among all female cancer patients. October has been declared International Breast Cancer Awareness Month. Many Organisations worldwide organise workshops, seminars, and rallies around the world to raise awareness of breast cancer.

Breast cancer is a culturally sensitive topic in Bangladeshi communities, and most women are uncomfortable with discussing such problems and symptoms even with their relatives. There is a need for awareness generation programs to educate women about breast cancer, propagate correct messages, and promote early detection of breast cancer. This year South Asia Centre for Medical Physics and Cancer Research (SCMPCR), a project of Alo Bhubon trust, organised a program to raise awareness about breast cancer among women in the Mirpur Rupnagar area. The seminar was held on 22nd October 2021 at the Arambag Kollyan Somiti, Mirpur-6, Dhaka.

Dr. Alia Shahnaz (Professor, Oncology Department, Dhaka Medical College and Hospital) and Dr. Meher Jabin (Assistant Professor, Department of Radiotherapy, Sir Salimullah Medical College and Hospital) were present as special guests and delivered their special message on breast cancer to the audience. Prof. Dr. Hasin Anupama Azhari (CEO, SCMPCR and Alo Bhubon Trust) was also present as the chairperson of the event and Mr. Wazir Ali Khan Shafiq (President, Arambag Kollyan Somiti) was present as the chief guest. Dr. Dewan Shahiduzzaman (Member, Board of trustees, Alo Bhubon Trust) and Mr. Rezaul Karim Razu, on behalf of Ward Councillor, six no Ward, Dhaka North City Corporation attended the program as guests of honour.

Beacon Pharmaceuticals Limited sponsored the seminar. On behalf of Beacon Pharmaceuticals Ltd, Mr. SM Mahmudul (Haque Pallab, Vice-President (marketing) of Oncology and Biotech) and Ms. Nashita Huq, Jr. (Assistant Manager, Product Management Department) were present as special guests. The seminar was focused on preventive measures and treatment approaches of breast cancer. This program garnered a tremendous amount of positive feedback from the audience and guests. The participants were delighted with the event and expressed a desire for more similar activities in the future. They also committed to passing on the breast cancer awareness message to their relatives and friends so that more people will be aware of the signs and symptoms of breast cancer and screen themselves by clinical breast examination. The very positive response from the attendees motivated the SCMPCR team to organise further seminars and activities for those who lack access to such information and health services. The SCMPCR team hopes to perform more work like this in the future to assist those in need.

Progression of Medical Physics: Technological Push

DR. S. P. Mishra

Visiting Prof.and Ph D Guide, Sr. Scientist, and Advisor, Dept Of Radiation Oncology

Dr. Ram Manohar Lohia Institute Of Medical Sciences, Lucknow (UP), India

The Medical physics activities originated in India, as in other parts of the world, in the Departments of Radiotherapy to coordinate with medical specialists in facilitating and harnessing the beneficial use of radiation both in therapy and diagnosis. As the technology evolved, medical physics made inroads in Radio-diagnosis and Nuclear Medicine. Dr. Ramaiya Naidu, trained in the Madam Curie institute, has the distinction of being the first medical physicist in India who pioneered the establishment of the radon extraction plant at Tata Memorial Hospital, Bombay in 1938 for use in cancer treatment. . Thereafter, medical physics progressed in leaps and bounds and a quantum jump was achieved, giving it a permanent footing, when Bhabha Atomic Research Centre started the one year Post Graduate Diploma in Radiological Physics in 1962.

Medical physics in India has found a place of pride in the global Medical Physics arena, and alumnus of BARC are working all over the world making path breaking contributions and innovations. Medical Physicists have multifold activities which include facility planning, radiotherapy treatment planning, quality assurance of facilities in radiotherapy, radio-diagnosis and nuclear medicine , radiation safety of personnel and the public, teaching, training and research. Medical Physicists are also assigned the responsibilities of Radiological Safety Officer (RSO) in medical radiation facilities and liaise with competent authorities of radiation safety ie. AERB. The routine era of Cobalt/Radium/ Caesium and other facilities have become a harbinger both for technological up-gradation and enhancement of skilled professionals. In North India, in the past two decades the subject has progressed with enrichment in advanced technology and thus, the demand for highly skilled specialist medical physicists and qualified personnel has increased.

The demand for research, education, internships, practical training, and teaching designed to guide Radiation oncologists, Medical Physicists and Radiotherapy, radiology and nuclear medicine Technologists is growing. The infusion of advance technology viz. multi energy linear accelerators, precision brachytherapy systems, tomotherapy, cyber knives, gamma knives , PET–CT, SPECT-CT, functional MRI and isotope laboratories brought spectral changes and challenges in medical physics activities. These facilities require different skills and training for fault free operation of the applications for human diseases management. Up-gradation in the status of medical physics was a natural corollary result of the development of high end technology.

Now, large numbers of medical physicists are working as teaching faculty (at the level of Prof, Addl. Prof , Asso. Prof and Asstt. Prof) in medical institutes and medical colleges across the country in parity with other fellow medical professionals. There are medical physics professionals who are working as scientists, medical physicists and consultant medical physicists as well in various sectors.

Modern technology in medical physics demands availability of highly skilled professionals and this is rising very rapidly. Five cutting edge proton therapy devices, and one carbon ion therapy device is planned for installation across the country and will soon be operational; two such facilities are already functional. This has pushed the medical physics community to take on the challenge of capacity building , and training specialist teams to be ready for the integration and utilisation of state of the art facilities. The advent and multifaceted growth in radiation oncology technology has ushered in an era of unprecedented progression as the case across the world. In the last two decades, North India has established a large number of facilities at huge costs and many more are in the process of commissioning .

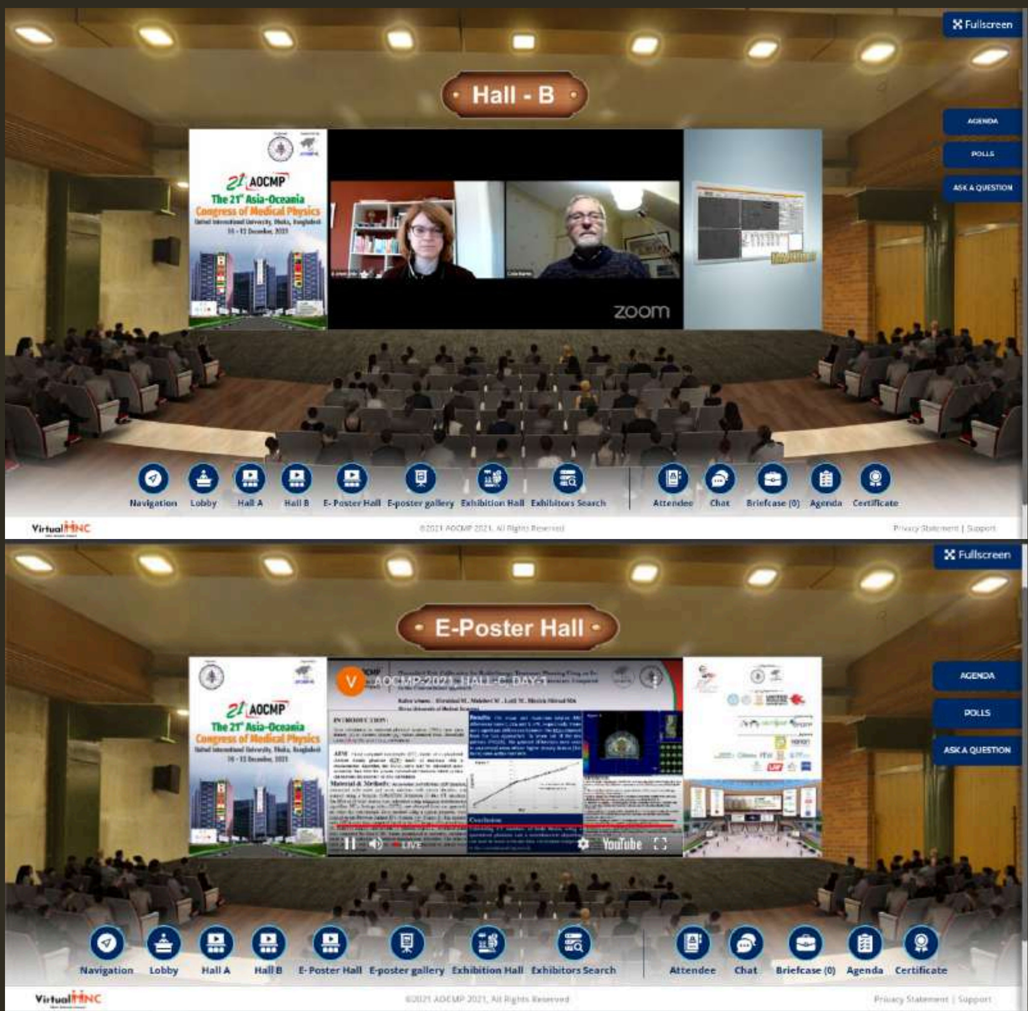
As a routine, Medical Physics is provides comprehensive Physics and Dosimetric services for the treatment of cancer patients. The modern medical physicist in radiation oncology has acquired expertise in all advanced treatment techniques like 3DCRT, IMRT, IMAT, VMAT, IGRT, SBRT, SRT, SRS, 4D Respiratory gating, Brachytherapy etc. The other activities in which medical physicists engage in are the commissioning of new radiation generating equipment and treatment planning systems, calibration of radiation monitoring instruments, QA and maintenance of treatment machines, verification of radiation dose delivery, radiation safety, room designing, research, teaching, training and compliance with radiation safety regulators (AERB).

India has vast experience in the field of Medial Physics and teaching courses are being conducted in the country since five decades ago. India has well-structured Medical Physics courses and presently several Medical Physics courses are being conducted across various universities in different parts of the country, producing adequate numbers of Medical Physicists annually to cater the need in the healthcare sector of the country. India has initiated various steps for strengthening its Medical Physics programmes by reviewing and revising the syllabi periodically to incorporate the advanced techniques recently introduced in the field of Medical Physics. Many institutes in North India are running annual compulsory internship/residency programmes recognised by AERB.

In the treatment of cancer, Medical Physicist work in multi-specialty hospital environments and require different skills of applied medical physics. The work requires interpersonal skills and coordination with various professionals, and it may be necessary for the training to inculcate managerial skills too for better gelling with the other colleagues engaged in treatment. Presently, there are more than 25 universities or institutions conducting Post M.Sc., Post Graduate degree, or diploma courses in Medical Physics across India.

It may be prudent to work towards enhancing research and innovation in Medical Radiation Physics; more universities and institutions may be persuaded to commence Doctor of Philosophy (Ph.D.) in Medical Physics programs. The Association of Medical Physicists of India (AMPI) was founded in 1976 with the objective of strengthening medical physics knowledge in the country, and has played a critical role in enhancing the capabilities of the medical physics community to address the demand of technological up-gradation. AMPI is also affiliated with many world bodies working for advancement and knowledge dissemination. The Indian college of medical physics (ICMP) under the patronage of the AMPI is working as an accreditation institute to certify the quality of medical physicist, which has helped in levelling the playing field. AMPI (NC) is the affiliate body of AMPI which works on academic pursuits in North India and has proved beneficial for medical physics community.

The virtual platform used to conduct 21st AOCMP congress of Medical Physics



India

Active Breathing Control (ABC): Sharing Our Initial Experience

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Introduction

Radiotherapy plays an important role in the management of cancer. However, there are many challenges associated to the whole course of treatment, the inter-fraction movement of tumors is one of the big challenges faced during the radiation delivery, if image guided therapy options are not available then it may limit the prescribed single fraction dose. Furthermore, managing the inter-fraction movement due to respiration is essential to deliver prescribed dose accurately to target volume. There are several techniques to overcome the underlying problem. The active respiratory gating technique is one of the most common method to manage respiration [1]. This technique involves the delivery of radiation during a particular phase of the respiratory cycle. Furthermore, there are several other techniques to apply the method but deep breathing method and active breathing control are commonly used in radiation therapy. During deep breathing method the patient takes a deep breath before the beam is turned on, this causes an increase in distance between the PTV of left breast and heart which results in less dose delivered to the heart causing less chances of developing radiation induced cardiac diseases. Active breathing control (ABC) is another method used to regulate respiratory movements which facilitate breath hold without requiring the patient to reach maximum respiratory capacity [2]. ABC device can be utilized to suspend breathing in any predetermined position along regular respiratory cycle.

Coaching

The patient is first scheduled for a coaching and the RTT explain the whole procedure. During this session RTT couches the patient to perform the breath hold procedure multiple times. When the RTT feels confident, that patient is ready for simulation, he will determine how long the patient can hold their breath. Usually, 20 seconds breath hold is required to perform treatment with this technique.

Simulation

The RTT clamps the patient's nose to avoid accidental breathing. A mouthpiece is given to the patient, attached to a breathing tube. After adequate air inhalation, patient is asked to hold their breath. A small valve in the breathing tube closes to prevent air to enter patient's lungs. This stops movement. If at any time the patient wants to take a breath, the patient releases pressure on a switch and the valve automatically opens to inhale. The RTT acquire CT images while using ABC. It provides a clearer image and the edges of the tumor are well defined.

Treatment

On the day of treatment, the RTT position the patient following the same protocol as in the simulation. Once the nose clamp and mouthpiece are in place, treatment begins. Figures describe the treatment procedure. Furthermore, before given the first radiotherapy fraction patient underwent for setup verification, after verification the patient hold their breath and the RTT delivers a radiation beam to the target area. Typically, the deep-breath hold procedure is repeated four to six times during each treatment. The whole course of treatment will be delivered with the same procedure.

Daily patient assessment

During the daily assessment, observations were made to assess if the patient has difficulties while they are holding their breath, if the patient is experiencing radiation related skin burn or irritation, observations were also made about weakness and weight loss experienced by patients

Discussion

Previously, patients of left sided breast cancer were treated without respiratory gating techniques which lead to unnecessary dose to the heart and increased chances of radiation induced heart diseases. With the advancement in technique now, in SIUT radiotherapy department ABC machine is utilized to treat patients with left breast cancer. The patient is counselled by the radiation oncologist. At the time of simulation, the radiation technologist guides and helps the patient practice breath-withhold, known as the trial phase during which the threshold time for breath hold is decided under the supervision of the radiation oncologist. After planning by the radiation physicist the patient is treated using

fig 2: Simulation

fig 1: Coaching

the same ABC protocol which was defined during simulation. Managing the inter fraction movement due to respiration is essential to deliver prescribed dose accurately to target volume. The Radiation technologist require special training in performing the ABC procedure, multiple training sessions were conducted in SIUT in order to ensure the quality treatment.

Conclusion

ABC is an advanced and non-invasive procedure which ensures precise dose delivery to the target volume while minimizing the excess dose to the heart, thus preventing radiation induced heart diseases. The radiation technologist plays an important role in performing the ABC procedure from simulation to treatment, the technologist helps the patient to overcome any difficulties, while also confirming proper dose delivery

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Installation, Acceptance Testing, Commissioning and Quality Assurance of Bebig Co-60 HDR Brachytherapy Afterloader at RMCH, Rajshahi

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Abstract:

In Brachytherapy treatment, the accuracy of radiation dose delivery is highly dependent on the initial source installation tests, acceptance testing, and quality assurance program. These tests were carried out at Rajshahi Medical College Hospital (RMCH), where a new BEBIG Multisource Co-60 HDR Brachytherapy machine was installed. The reference Air Kerma strength (maximum dose distribution) was determined by using a well-type ionization chamber (model PTW [SN] 000595) and electrometer (model PTW UNODOSE [SN] 082145). A radiation survey was performed around the brachytherapy machine and outer walls of the treatment room by using a certified well-calibrated radiation survey meter NUCLEONIX [CMP710P]. The quality assurance program, acceptance tests and commissioning of the HDR brachytherapy unit were completed carefully and successfully. The Air Kerma strength was calculated and measured, and the values were 15.88 mGy/h and 16.11 mGy/h, respectively. The deviation was 1.42% which does not exceed the tolerance limit ±3%. The calculated and measured source activity were 51.92 GBq and 51.87 GBq, respectively, and the deviation was 0.09%, which is within the tolerance limit of ±3%. The quality assurance program was done entirely according to ESTRO Booklet 8, and the results were satisfactory. The source position accuracy, dwell time and timer accuracy were measured following the Manufacturer's guideline standard protocol.

Table 1: Machine Specifications Checklist

Test	Requirements
1	Number of channels of the machine
2	Functioning of sensors like pressure, torque, optical
3	Coupling between guide-tube and unit
4	Coupling between guide- tube and applicator
5	Coupling between drive cable and source
6	Time taken to drive the source to" ON" "OFF".
7	Source guide free of kinks?
8	Mechanical integrity of applicators & position of shield, if any
9	Interlocks
10	Source Safe Display
11	Control Console Display
12	Control Console Function

Introduction:

Brachytherapy is a combined treatment with EBRT or chemotherapy. It is mainly used when the malignant or cancer tissue is well defined. About 10–20% of all radiotherapy patients are treated with Brachytherapy in a typical radiotherapy department. Brachytherapy treatments are more developed in the 21st century with modern treatment modalities than before. Modern Brachytherapy is changed beyond recognition to what it was even 50 years ago [1]. Nowadays, we can use complex software programs for brachytherapy treatment planning with linked simulators like CT, MRI, X-ray and ultrasound machines for tumour localization.

The Brachytherapy treatment is a part of external beam radiation therapy treatments for a few cases of cancer. Brachytherapy is also known as curie therapy or endocrine therapy. It is mainly used when the malignant or cancer tissues are well defined and treated by placing a temporary or permanent small, encapsulated radioactive source at proximity to the tumour. The radioactive sources are continuously emitting photon energy. The localized dose delivery is improved at the point of interest better than that of External beam radiation therapy. There are different types of cancer that are treated by brachytherapy, especially intracavitary and interstitial treatments [2].

In low-income and middle-income countries, the number of cervical cancer cases increases day by day. Brachytherapy treatment is more effective for well-localized tumour, which improves local control and survival rate. In this regard, the American Brachytherapy Society (ABS) published the recommendation for cervix brachytherapy treatment in low-income and middle-income countries [3].

Brachytherapy plays an essential role in treating cancers of several sites, including the brain, head and neck, uterine cervix, endometrium, and prostate. It is an essential part of cervical cancer treatment, as it allows the cervical tumour to treat with very high-dose radiotherapy while protecting the bladder, rectum and sigmoid colon. Brachytherapy is also used to treat coronary artery disease to prevent restenosis after angioplasty. The brachytherapy treatment reduces the prospective infection, and as the treatment time is usually shorter with fewer fractions than EBRT, the patients have to spend less time in the hospital. The patient can also be benefitted by avoiding any surgery [4].

Compared to conventional external beam radiation therapy, the physical advantage of brachytherapy is a superior localization of dose to the tumor volume. On the other hand, the dose gradients around an implant and dose heterogeneity within an implant are much higher than external beam radiation therapy. In the past, brachytherapy was performed as Low dose rate (LDR) treatments using radium 226 and radon 222 sources. However, these radioisotopes are no longer used because of their disadvantages. Modern brachytherapy is performed as a High dose rate (HDR) treatment using ^{60}Co and ^{192}Ir high energy radioisotopes with their ideal properties [5].

Materials and Methods:

This study was done at the department of radiotherapy in Rajshahi medical college hospital Rajshahi, Bangladesh. This study mainly deals

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with the machine installation and observation of the source air kerma strength using the well-type ionization chamber and electrometer. The study includes the confirmation of radioactivity of the radionuclide and the safety measures of the machine. A radiation survey was carried out around the brachytherapy treatment room using a certified well-calibrated radiation survey meter. Other checks such as safety, mechanical, and dosimetry were also done.

Result:

Room design and Shielding

A single room with sufficient space is the best choice for brachytherapy treatment. For the machine room, it is very important to ensure that there is enough room space for afterloader equipment and safety entrance for patient trolley and emergency purposes. The room was built following IAEA standard protocol. Wall shielding is fully concrete, and the door was lead shielded [6].

HDR Machine Specification

The initial step is to verify that the machine complies with IAEA standards for the Brachytherapy treatment. This should be conducted appropriately prior to the installation of the machine. The exact method for safety checks has to be adapted to the local situation. The machine quality checklist summarised in table 1 is performed. If the machine fulfils the required functions, then the machine is recommended for Brachytherapy treatments and can be installed. The following functions are required for a Brachytherapy machine:

Machine and Source Installation

The manufacturer expert engineer did machine and source installation, and the requirements listed in table 2 were checked before installation. These checks are called pre-installing tests, and when everything is in good condition, the machine is ready for installation. The manufacturer has guidelines and standard protocols for the machine and source installation.

Acceptance Testing and Commissioning

After installing the machine, acceptance tests and commissioning tests were performed. Acceptance and commissioning tests assure that the specifications contained in the purchase order are fulfilled and that the environment is free of radiation and electrical hazards to staff and patients. The tests were performed in the presence of a manufacturer's representative. Upon satisfactory completion of the acceptance tests, the physicist signed a document certifying that these conditions were met (Table 3, 4 and 5).

When the physicist accepted the unit, the final payment was made for the unit, ownership of the unit was transferred to the institution and the warranty period began. Therefore, these conditions impose a heavy

Table 2 : Checklist before of Machine Installation

Test	Requirements
1	Package indicators activated?
2	Wooden box damaged or forced?
3	Multisource damaged (Resulting from the damaged wooden box or not)?
4	Power supply/potential equalsation according to the specification
5	Installation of Termination boxes
6	Test of computer
7	Software update
8	Operational test with dummy
9	Inspection of multisource unit
10	Inspection of electrical safety

responsibility on the physicist for the correct performance of these tests. Acceptance tests may be divided into three groups:

(I) Safety checks;
(II) Mechanical checks;
(III) Dosimetry measurements.

A number of national and international protocols exist to guide the physicists to perform these tests.

Remote Afterloader Annual QA:

The annual review of the remote afterloader function should be comprehensive, approaching the thoroughness of initial acceptance testing. For remote afterloader, all source and applicator tests should be performed, including verification of source strength and radiographic examination of intracavitary applicators. Timer accuracy and linearity should be measured more comprehensively, although measurement over the range of use may be practical. Positional accuracy should be checked carefully, including the condition and dimensions of all dummy sources. The radioactive source location should be compared directly to their dummy source counterparts, possibly by superposing autoradiographic images with transmission radiographs of dummy sources on the same film for various applicators. Additional HDR tests include a comprehensive assessment of positional accuracy, including all positional accuracy tests, measurement of transfer tube lengths, and

Table 3: Safety acceptance tests and results.

Test	Requirements	
1	Communication equipment	Satisfactory
2	Check of treatment without indexer lock, without applicator attachment	Satisfactory
3	Door interlock test/ Treatment interrupts/ Emergency stop, Power interrupt	Satisfactory
4	Emergency equipment (forceps, emergency safe, survey meter, source disposal kit)	Satisfactory
5	Radiation Monitor detector, light indicators Satisfactory	Satisfactory
6	Timer, secondary timer	Satisfactory

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direct verification of all simulation source localization protocols. Additional temporal accuracy tests include the assessment of transit dose. The AAPM Task Group No. 59 is currently developing guidelines for patient-specific QA of brachytherapy using HDR remote afterloaders [7].

Radiation Survey

After the machine and source installation, measurement of leakage radiation is very important around the machine, inside and outside the machine room, with a wall on both sides. Radiation measurements were undertaken around the brachytherapy machine using certified and well-calibrated digital contamination radiation survey meter NUCLEONIX [CMP710P]. The digital contamination monitor (micro) is a portable microcontroller based battery operated instrument designed primarily to measure Beta/Gamma radiation. It can be used to measure three modes CPS, CPM, Preset and Dose rate modes. The unit can measure up to 0-200mR/hr with an end window detector. The minimum reading 0.04 mR/hr was found at the wall of the control console. The maximum reading 0.20 mR/hr was recorded at the front of the machine surface, which was within limits (Table 6)

QC measure of HDR machine

Quality control is essential for the best treatment and machine life. A physicist should do a routine check to maintain the treatment machine for the treatment. During the quality control, if there is any error or deviation, it should be corrected before the treatment.

Timer accuracy and calibration

After the survey, it is required to check the source activity, decay and timer accuracy. Machine function is checked by connecting the source guide tube with the afterloader indexer.

Source Position Check

A visual camera or film can be used to know the accuracy of source positioning. The camera contained a millimetre scale. The camera and Dummy need to be connected with the indexer by the source guide tube to check the source positioning. The accuracy of source positioning with tolerance as specified is ±1 mm.

Pre-Treatment Source Strength Verification Test

Source strength should be compared with the source decay table. A well-calibrated Nucletron SDS and Unidos E dosimeter were used to determine the source strength. The sweet spot was recorded by using a well-type ionization chamber and electrometer. All the instructions given in the manual were followed. The time exposure was 20 seconds, and the biasing voltage was -300V. The sweet position was observed at the 10th position in the chamber. The dwell time was set to 60 seconds. The calibrated source strength trial was observed at various dates were compared with the respective manufacturer's calibration source strength. The deviation between the calibrated source strength was observed with the manufacturer's calibration source strength. It was found to be 1.42%, which was less than the tolerance limit.

Time Error

Time taken to drive the source to ON and OFF positions was found to be 6 seconds. Time error was measured in charge mode with and without interruption of treatment. The result was measured at 0.5368%, which is less than the tolerance limit of 1%.

Quality assurance:

Quality assurance is the procedure that ensures consistency of the medical prescription and safe prescription fulfilment, as radiotherapy aimed minimal exposure and adequate patient monitoring to determine the result of the treatment (Table 7) [8].

Table 4 : Treatment Planning System acceptance tests and results.

Test	Requirements	
1	User Documentation - BEBIG	Satisfactory
2	Scanner/Printer	Satisfactory
3	HDRs planning software	Satisfactory
4	Standard plan - Calculation check	Satisfactory
5	Plan Reproducibility	Satisfactory
6	Time, date & decay check	Satisfactory
7	Patient file backup	Satisfactory
8	Patient data transfer	Satisfactory

Table 5: Treatment Unit Control Console acceptance test and result.

Test	Requirements	
1	User Documentation - BEBIG	Satisfactory
2	Printer Satisfactory	Satisfactory
3	Patient file transfer, Treatment	Satisfactory
4	Robot control	Satisfactory
5	Interrupts	Satisfactory

Table 6: Radiation Survey Measurements

Test position	Measured data (mR/h)
Top	0.17
Button	0.12
Front	0.32
Back	0.15
Right	0.11
Left	0.20

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Table 7: Frequencies and Tolerances of Quality Control Tests for HDR / PDR afterloading Equipment. (3M- Quarterly; 6M- Biannual; A- Annual; SE- Source Exchange).

Description	Minimum Requirement: Test frequency	Minimum Requirement: Action Level
Safety System		
Warning lights	Daily/ 3Month	Satisfactory
Room monitor	Daily/ 3Month	Satisfactory
Communication Equipment	Daily/ 3Month	Functioning
Emergency Stop	3Month	Functioning
Treatment interrupts	3Month	Functioning
Door interlock	3Month	Functioning
Power loss	3Month	Satisfactory
Applicator and catheter attachment	6Month	Satisfactory
Obstructed catheter	3Month	Satisfactory
Integrity of transfer tubes and applicator	3Month	Satisfactory
Timer termination	Daily	Satisfactory
Contamination Test	Annually	Satisfactory
Leakage radiation	Annually	Satisfactory
Emergency equipment (forceps, emergency safe, survey meter)	Daily/ 3Month	Functioning
Practicing emergency procedure	Annually	Functioning
Hand cranks functioning	Annually	Functioning
Hand held monitor	3Month/ Annually	Satisfactory
Physical Parameter		
Source position	Daily/ 3Month	>2mm
Source calibration	SE	>5%
Length of treatment tube	Annually	>1mm
Irradiation timer	Annually	>1%
Date time , Source strength in treatment unit	Daily	Satisfactory
Transit time effect	Annually	Satisfactory

Discussion:

For a brachytherapy machine, a single room accommodation is the best choice. The room layout will depend on the thickness of the wall and shielding door for radiation protection. The room layouts also depend on the use of radioisotopes. The ^{60}Co half-life is 5.26 years, and its high specific activity undergoes β- decay to the excited states of 60Ni (94.4%). The ^{60}Co radioisotope emits γ-rays of 1.173 MeV and 1.332 MeV energy, averages to 1.25 MeV. The main β- rays emitted (99.88%) have a maximum energy of 0.318 MeV and average energy of 0.096 MeV. Physical dimensions of HDR ^{60}Co brachytherapy sources are 3.5 mm in length and 0.6 mm in diameter. The measured Air Kerma strength was compared with the TPS value, and the deviation was 1.42% which is within the tolerance limit of ±3%. The acceptance test, commissioning, and quality assurance tests were completed with high accuracy according to manufacturers' guidelines, and the results were well within the acceptable range. The acceptance test results showed the status of the BEBIG Multisource ^{60}Co HDR brachytherapy unit, and its components are functioning well. Radiation doses that are delivered to the cancer patients are within the planned dose.

Conclusion:

Cervical brachytherapy was performed as a low-dose-rate (LDR) therapy using radium (^{226}Ra) or its daughter element radon (^{222}Rn). Radium has the advantage of a very long half-life, but it also has the disadvantage of producing the alpha-emitting gaseous daughter product radon. According to modern radiation safety standards, radium and radon sources are considered unsafe and are no longer used. Today, most interstitial and intracavitary brachytherapy treatments are being performed with high-dose-rate (HDR) temporary implant brachytherapy with ^{192}Ir or ^{60}Co, or LDR permanent implant brachytherapy with ^{125}I or ^{103}Pd sources. However, the choice of radionuclides for brachytherapy is limited because only a few have all the desirable properties of the ideal brachytherapy source.

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Does Hybrid Technique Enhance the Plan Quality for Treatment of Breast Cancer Including Regional Lymph Nodes

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Treatment of breast cancer with radiotherapy (RT) is a key in the adjuvant treatment, improving both local control and overall survival (Abe O et al 2005, Darby S et al 2011). Several radiotherapy ideas and techniques have been well-known utilized last few decades. Static three-dimensional radiotherapy (3D-CRT) known as the conventional radiation technique, where the tangential opposing fields with hard wedge filters (WF) are used in Cobalt-60 machines. Modern dynamic irradiation techniques by linear accelerators, such as field in Field (FiF), intensity-modulated radiation therapy (IMRT) and volumetric modulated arc therapy (VMAT), at the time to generate more uniform and conformal

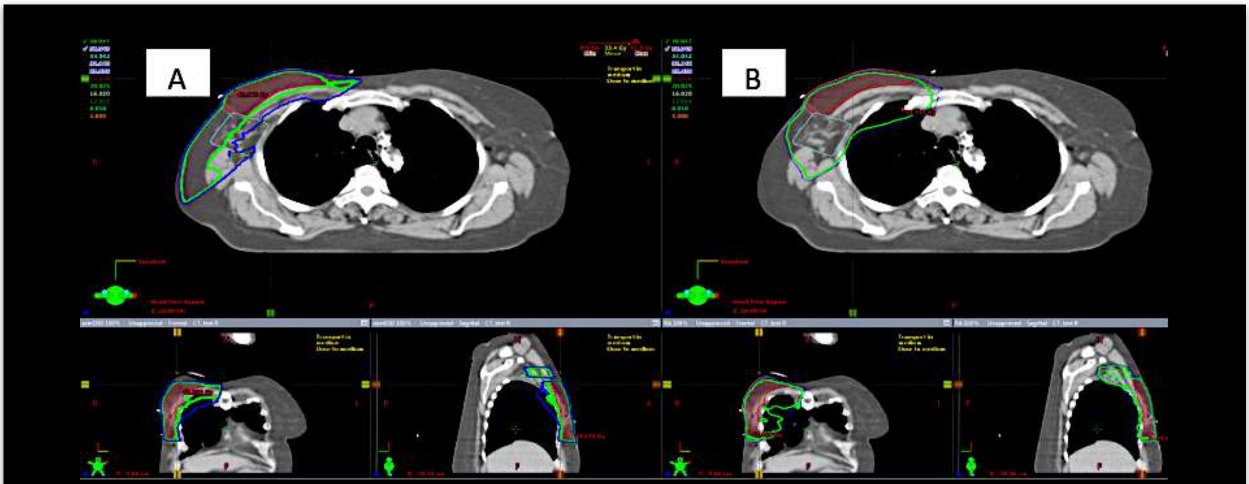

Figure 1: The dose distribution of VMAT100% and FiF100% % in transversal, frontal, and sagittal plan.

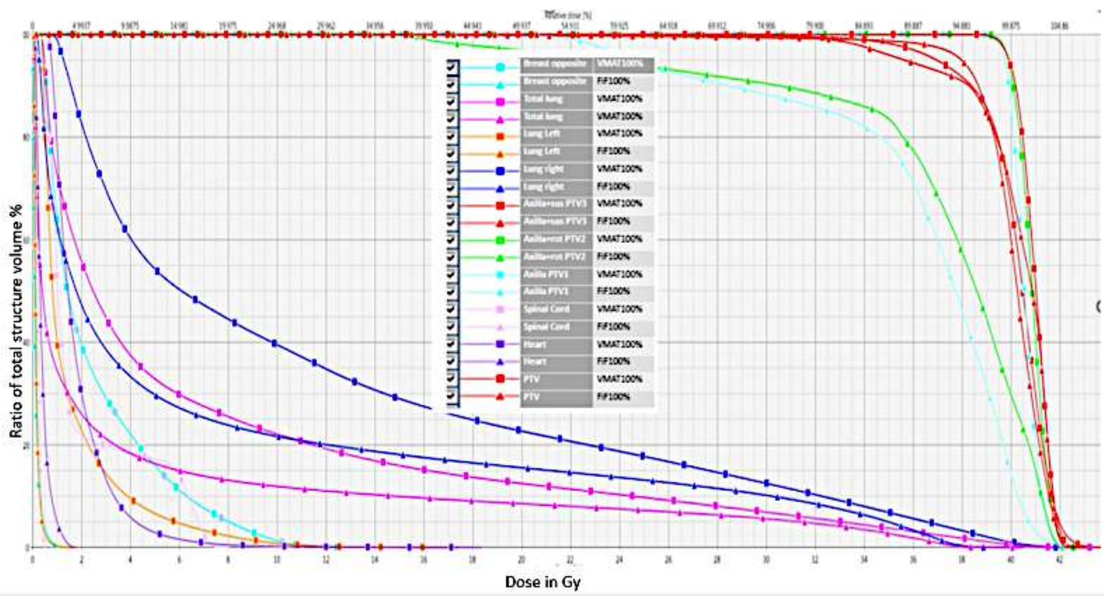

Figure 2: The comparison of DVH between VMAT 100% and FiF100%

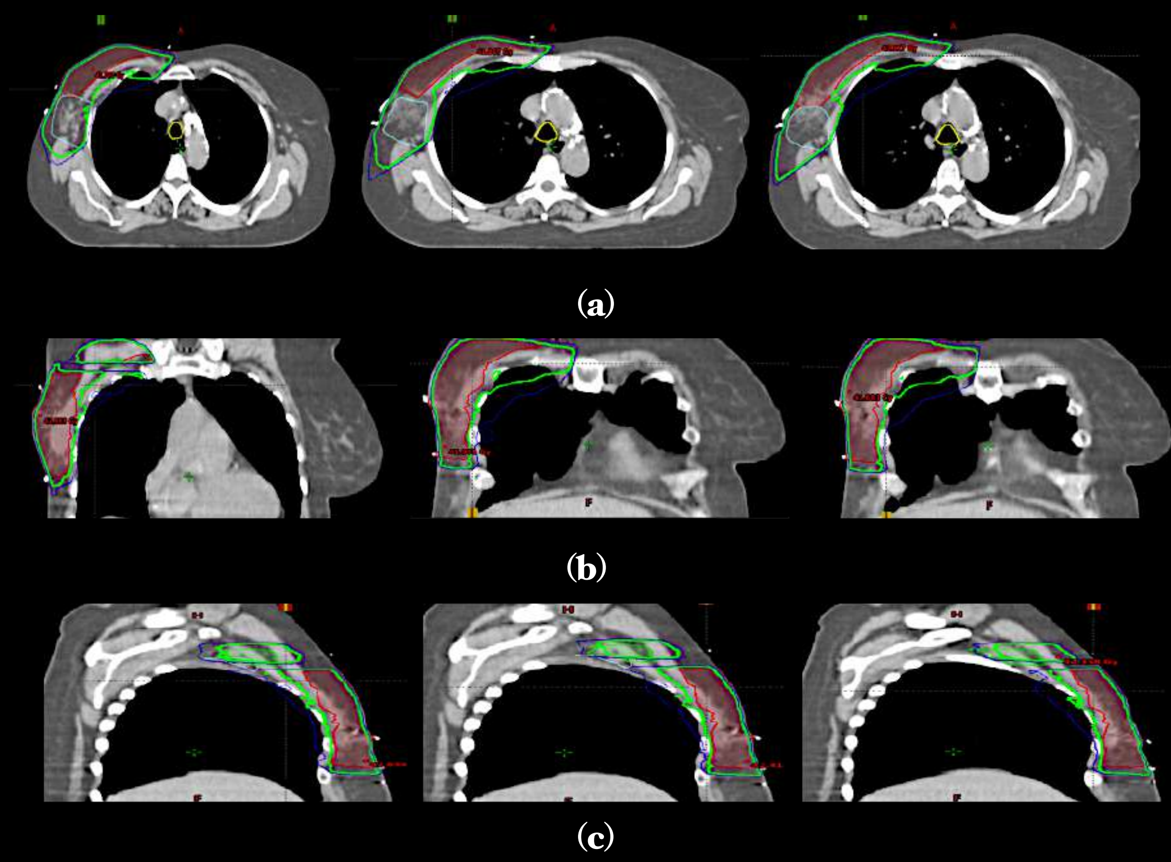

Figure 3: Dose distribution of (a) VMAT50%+FiF50%, (b) VMAT70%+FiF30%, (c) VMAT80%+FiF20% in transversal, frontal, and sagittal plan respectively.

dose distributions for the planning target volume (PTV) and less dose to organ at risk (OAR) (Dogan et al 2007, Kestin LL 2000). However, dynamic radiation techniques allow the risk of increased induction of secondary tumors at compliment to larger areas of low-dose exposure and increased monitor units (MU) (Hall EJ 2006). To equilibrium the respective benefits of static and dynamic radiation techniques, Mayo et al (2006) have established a composite method combining 3DCRT and IMRT named hybrid intensity-modulated radiation therapy (H-IMRT).

Hybrid technique combines 3D-CRT with VMAT or IMRT plans with different proportions. In this dosimetric study, we examined the influence of different variations with respect to the 3D-CRT base plan and VMAT ratio for the application of hybrid technique. Patients were assessed in terms of good PTV dose coverage and reduces organ at risk (OAR) exposure.

The prescribed dose was 40.05 Gy in 15 fractions. Figure I shows the isodose distribution of FiF and VMAT in A and B respectively. The comparison of dose volume histogram (DVH) between VMAT 100% and F100% is presented in figure 2.

Analyzing figure 1 and 2, the results showed that VMAT covered better PTV compared to FiF technique. However, the low dose to the organ at risks (lung) raises by VMAT. In breast radiotherapy, the lung is the main and critical organ of interest. The dose to contralateral breast is another vital reason to be consider mainly for younger patients. This gives us a trigger to develop hybrid technique. We mixed these techniques (VMAT and FiF) in different ratio to balance the PTV dose and reduce the OAR.

Figure 3 shows the dose distribution of different ratio of VMAT and FiF in transversal, frontal, and sagittal plan. Figure 4 shows the comparison of DVH of different ratio of (VMAT50%+FiF50%, VMAT70%+FiF30%, VMAT80%+FiF20%) VMAT and FiF. Mixing different ratio of these two techniques also showed the mix results. A smaller amount of low dose bath to the heart, lung and other organ at risk should be the goal because the breast patients are long term survivors. The selecting of the ratio is very important, and it should be discussed in the department which ratio of plan is to be better. The QA of final

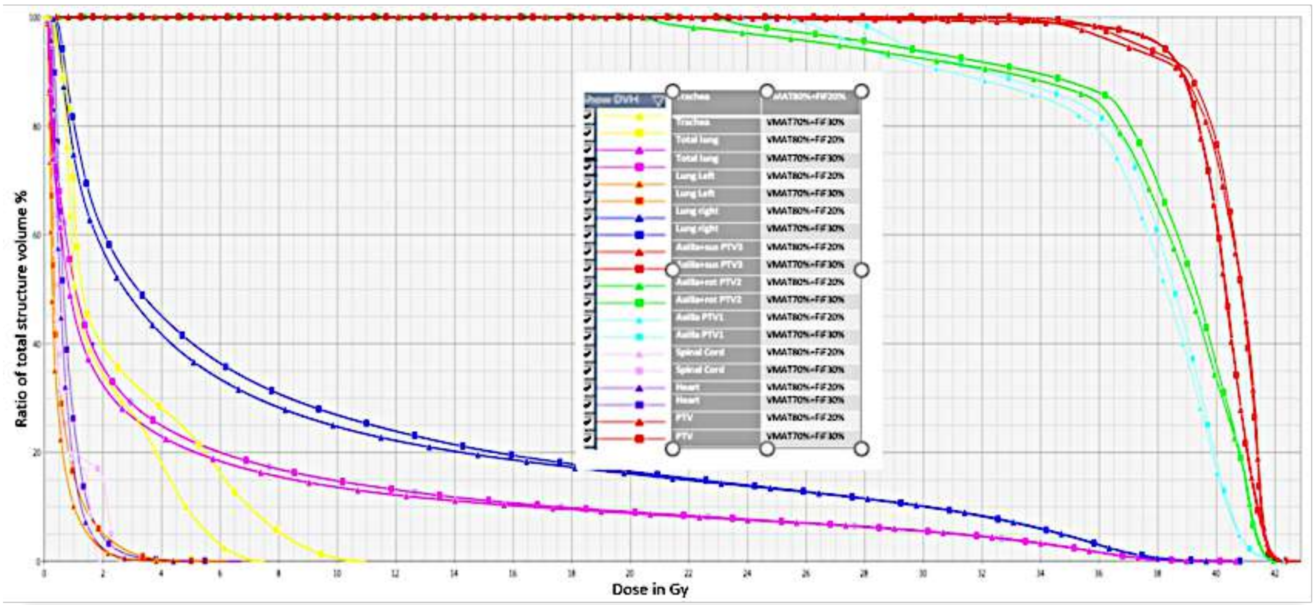

Figure 4: The comparison of DVH between VMAT50%+FiF50%, VMAT70%+FiF30%, VMAT80%+FiF20% respectively.

plan must be done before to start the treatment.

Hybrid technique demonstrated better PTV dose coverage, conformity, and homogeneity and reduces the exposure to the organs at risk. The primary results showed that proposed technique enables a robust treatment while obtaining a balanced mix (VMAT and FiF) between dose coverage to the PTV and OAR.

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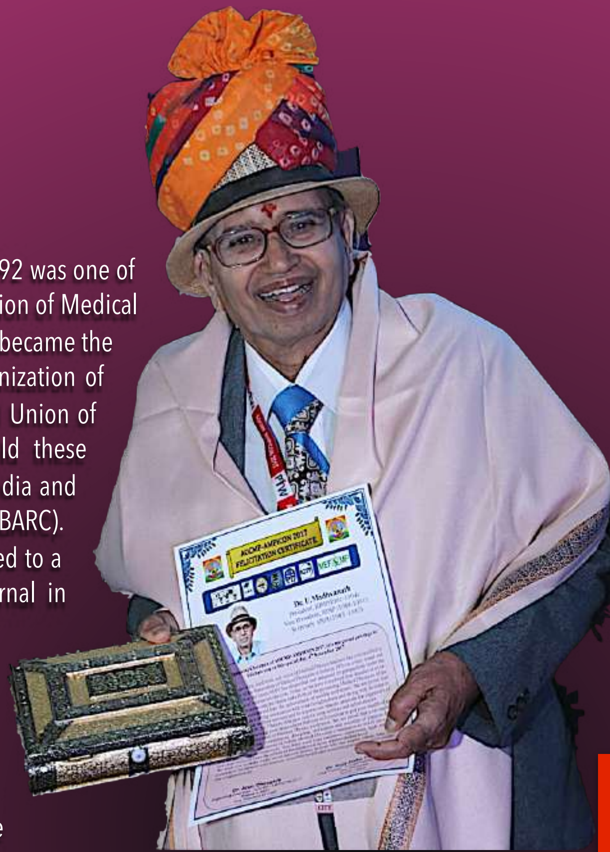
Journey of Dr U Madhvanath from 1932 to 2021



Dr U Madhvanath retired as the Head Division of Radiological Protection in 1992 was one of the founding fathers and served as Secretary and Vice President of the Association of Medical Physicists of India (AMPI) for the terms 1983-85 and 1985-87 respectively. He became the Vice President (1988-91) and President (1991-94) of the International Organization of Medical Physics (IOMP) and the Vice-President (1994-97) of the International Union of Physics and Engineering Sciences in Medicine (IUPESM), the first to hold these positions from Asia. He took lead to establish medical physics education in India and the DRP course was initiated in 1962 at the Bhabha Atomic Research Centre (BARC). He was the first editor of AMPI quarterly bulletin started in 1976 and upgraded to a journal in 1993. The Journal of Medical Physics (JMP) is an indexed journal in PubMed today.

Dr Madhvanath was awarded Dr Ramaih Naidu Oration award in 2000, the highest honour of AMPI. Asia-Oceania Federation of Organizations for Medical Physics (AFOMP) awarded him the Outstanding Medical Physicist Award. IUPESM honoured him by including in the first List of Outstanding International Leaders of Medical Physics and Biomedical Engineering and the inaugural fellows of IUPESM.

I had the privilege of meeting and interacting with him during few of the annual conferences of AMPI. I had a more elaborate and personal communication with him before and during the 17th AOCMP and 38th AMPICON at Jaipur in November 2017, where he was felicitated for his outstanding contributions to the global development of medical physics along with 16 other global leaders of medical physics from India and across the world. He was gracious enough to share his wisdom not only in professional development but also in spiritual understanding. He gifted me a picture of Sai Ram Baba every time we had an interaction.I pay my respectful tribute to Dr U Madhvanath a versatile and farsighted teacher, leader and a great human being. May his soul rest in peace.

By Prof.Dr. Mary Joan, Department of Radiation Oncology (Physics), Christian Medical College and Hospital, Ludhiana, Punjab India.

India

Cancer Treatment Services at Bhaktapur Cancer Hospital in Nepal

Bidyapati Jha, Pramod Kumar Yadav, Ganesh Subedi, Ashok Pokhrel

Bhaktapur Cancer Hospital, Bhaktapur, Nepal

The Bhaktapur Cancer Hospital is the first national level government hospital equipped with a comprehensive cancer treatment centre in the capital and was established in 1995 on March 6th. In the beginning, the management committee was represented by personalities from the Nepal Cancer Relief Society, Rotary International, Ministry of Health and Local Community of Bhaktapur, along with high profile experts and professionals as advisors. Later, on Aug 8, 2019 management was taken over by government of Nepal. The government of Nepal decided to develop this hospital as one of the leading cancer institutes in the country. The 125 bedded cancer hospitals provides radiotherapy, chemotherapy, surgery, and palliative care services. The Bhaktapur cancer hospital occupies an area of 126 ropanies and currently staffs 280 employees.

Objectives:

- To establish the hospital as a state of art tertiary referral centre.
- To provide quality and compassionate care that is easily accessible to patients.
- To collaborate with different institutes, organisations, and communities in the field of preventive oncology and early detection.
- To provide palliative care services, as well as pain management and cancer support programs.
- To introduce a computer-based hospital management information system.
- To provide charity services to the poor and needy.
- To develop a cancer registry and improve telemedicine.
- To perform academic and research work in cancer.

The radiotherapy department in this hospital is equipped with both external beam radiotherapy and brachytherapy. At present, the radiotherapy department has a Varian Clinac IX linac equipped with 120 MLCs and the eclipse treatment planning system (software version 15.6), a Cobalt-60 teletherapy machine, and a Siemens 16 slice CT Simulator brachytherapy with Ir-192 source. Everyday about 150 curative and palliative patients are treated in the radiotherapy department. Almost 100 patients are treated using the Clinac IX and rest of the patients are treated using cobalt - 60. A team of 4 medical physicists, 5 radiation oncologists, 9 technologists and 3 others supporting staffs are currently working in the radiotherapy department . All team members have specific roles to be performed in order to provide the best possible care for the patient. Each patient undergoing radiation therapy must pass through the department workflow. Radiation oncology PG students from NAMS are also posted in our department for 6 month training programs.

The first patient radiation treatment was carried out using the cobalt-60 teletherapy machine which was installed on March 1, 1999. The cobalt source was replaced on the March 12, 2012. Today, the cobalt -60 teletherapy machines are used only for palliative treatment. A conventional simulator was also installed in 2002. HDR after loader brachytherapy with Ir-192 Source was installed in 2008. The Linac machine in this department has multiple treatment options including 2D, electron, and 3DCRT, and IMRT techniques.

Dosimetry devices used in this hospital are SNC Three dimensions water phantom, with two farmer type ion chambers, parallel plate chambers and two 0.125C ion chambers, including SNC electrometers, 2D water phantoms, TPR20/10 D phantoms, and Slab phantoms (solid water phantoms) . For patient specific QA portal dosimetry is used.

A new Linac machine, a bhabatron teletherapy machine, and a 64-slice dedicated CT machine are expected to be installed later this year.

Nepal

Uses of PET/CT and Procedures Performing in National Hospital of Sri Lanka

S.Colomboge (Senior Physicist), K.S.Hettiarachchi (Physicist)
National Hospital Sri Lanka

Positron Emission Tomography (PET) is the novel imaging modality used in medical imaging. A PET scan can be used to measure the body functions such as metabolism. It helps to examine the functions of organs and tissues of the human body. Combined PET/CT scanners use the fusion of CT in the PET image, which provides more accurate diagnoses than the two scans performed separately. The PET/CT scans are perform mainly to detect cancers while diagnosing. It is used to determine whether cancer has spread in the body or not. Then by following a proper treatment procedure, PET/CT scans are continually taken to assess the effectiveness of treatment and the tissue metabolism and viability. Further, PET/CT scans can be used to determine the effects of the myocardial infarction on areas of the heart. The brain abnormalities such as tumour, memory disorders, seizures, and other central nervous system disorders can also be diagnosed using PET/CT scans.

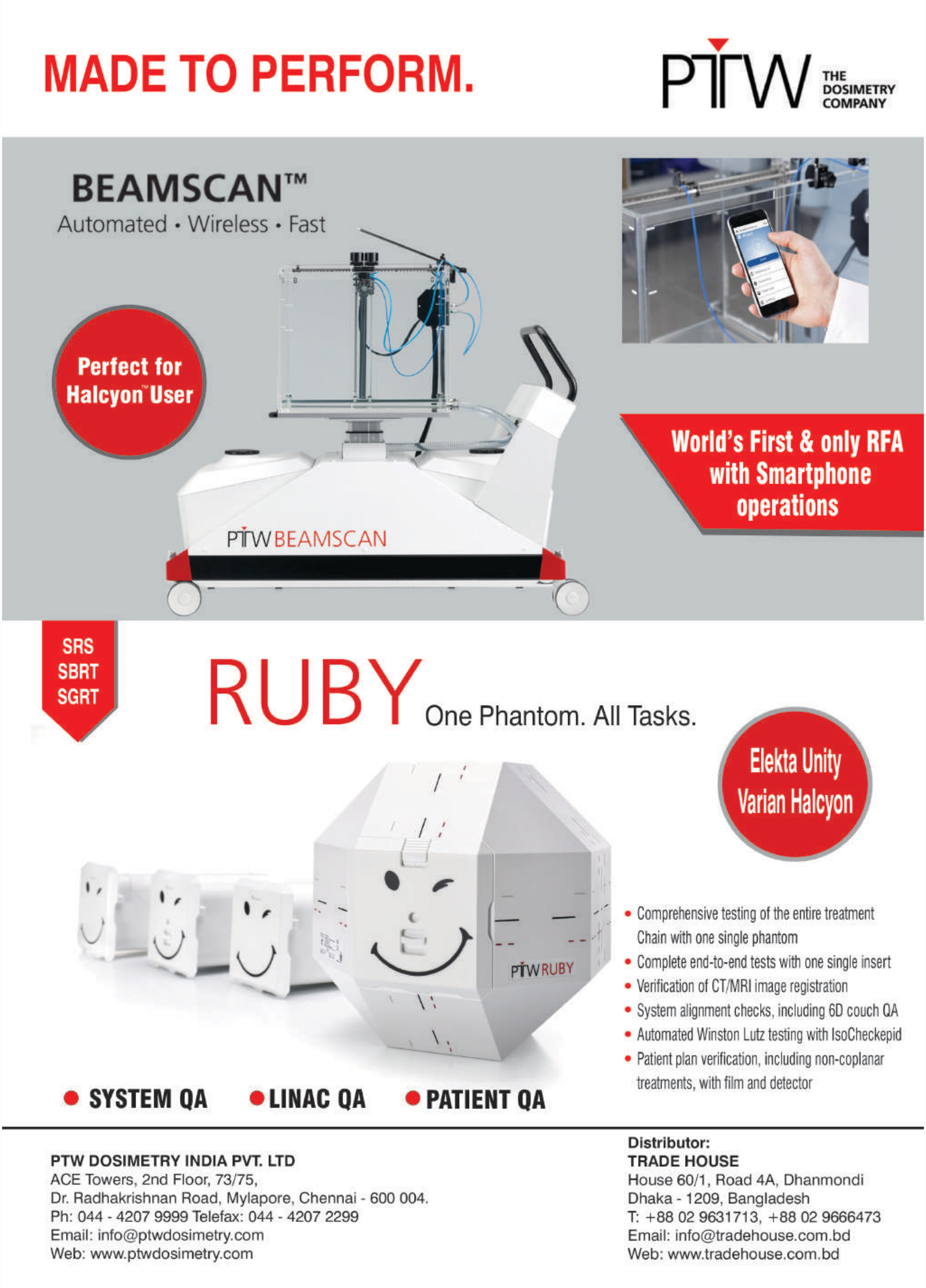
All the PET/CT units in Sri Lanka perform PET scans for whole-body examinations, while the National Hospital of Sri Lanka provides both brain and whole-body scanning facilities by giving high contribution towards better treatment.

PET imaging depends on the nature of the positron and positron decay. Positron is the antimatter counterpart of an electron, which has the same mass as an electron, but the opposite charge. When a nucleus undergoes a positron decay, it results in a new nuclide with one positron and one neutron and the emission of a positron and a neutrino.

As the positron passes through the matter, they experience the same interaction as electrons, reducing the energy through ionization and excitation. Finally, it annihilates with a free electron at rest and emits two photons with the same energy, 511 keV, in the opposite direction.

The radionuclide used in PET scans is made by attaching a radioactive atom to the chemical substances used naturally by the particular organ or tissue during the metabolic process. In Sri Lanka, FDG is frequently used for PET scans since the human body widely uses glucose for its metabolism. Other substances can also be used depending on the purpose of the scan. They are Oxygen, Nitrogen, Carbon and Gallium.

The radiopharmaceutical is used in PET/CT scans should be made by a special procedure, using sophisticated instruments including a cyclotron and a radiochemical laboratory. Originally, the PET procedures were performed in a dedicated PET centre, which consisted of cyclotron and radiopharmaceutical preparing laboratory facilities. However, the radiopharmaceutical is currently produced in different centres and sent to the PET centre. Therefore, the scanner is the primary instrument required to perform today's PET scan. The radiopharmaceutical for the PET/CT unit in Sri Lanka is imported from Chennai in India. When the radiopharmaceutical is imported, it should be located in an isolated laboratory before being administrated to patients. The radiopharmaceutical activity is measured before it is administrated to the patients. The PET/CT unit in the National Hospital Sri Lanka is commenced at the beginning of 2019. The National Hospital of Sri Lanka targets forty patients per month, depending on the activity received. Hence, the number of patients treated varies. The medical staff of the National Hospital, involving Radiologists, Doctors, Physicists, Radiographers, Nurses and other ancillary workers, provide their service more efficiently for the qualitative and quantitative outcome to the patients, aiming the radiation safety following the safety considerations while optimizing the radiation-based disasters.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SCMPCR

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(A Project of Alo Bhubon Trust)

SUBMISSION DEADLINE FOR NEXT ISSUE: May 31, 2022

The main objectives of SCMPCR

To organize awareness, prevention, and screening program for cancer disease;

To provide adequate training to all personnel associated with cancer treatment;

To establish the clinical residency training program for medical physicists;

To develop the infrastructure of e-learning and library;

To establishment Welfare home for poor cancer patients;

To build a self-help group for cancer patients;

To establish a team who will assist in the management and quality control (QC) procedure for the diagnostic radiology equipment in the districts levels;

"SCMPCR was established in 3rd July 2018 is comprised of a group of philanthropic personnel with representatives from different regions of South Asia to work on different projects. SCMPCR is an autonomous body, under Alo Bhubon Trust (Alo -BT) and accountable to its board of trustees/governors. It is a non-profit public partnership which will seek support from other sources. It shall work conjointly with various nationals and international organizations. Major activities of SCMPCR are: to produce skilled manpower, enhance health education and establish a welfare home for cancer patients"

MISSION

TO Achieve UNDP SDG-goal 3 & 4

OUR VISION

TO

PROVIDE QUALITY SERVICES IN CANCER TREATMENT THROUGH TRAINING, EDUCATION INCLUDING E- LEARNING IN RADIOTHERAPY AND IMAGING DISCIPLINES.

GOALS OF SCMPCR

Major activities of SCMPCR are to produce skilled manpower, enhance health education and establish a welfare home for cancer patients.

UNDP SDG-goal 3 (Good Health & Well-being)

Awareness program for the mass people for different communicable and non-communicable diseases, especially for cancer patients.

UNDP SDG-goal 4 (Quality Education)

Arranging and conducting training programs to develop skilled manpower. It realizes the need to educate specially; women regarding the screening and prevention of cancer treatment under UNDP SDG-goal 4.

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OUR MOTTO

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