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Medical Physics World

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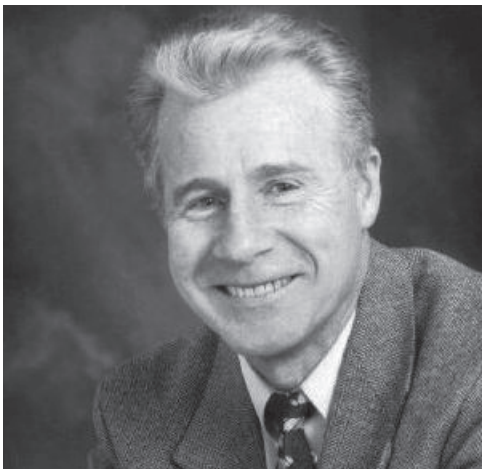

Barry J Allen, Ph.D.; President of IOMP

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Incoming President's Report

Barry J Allen, Ph.D.; President IOMP

As President-Elect of the International Organisation for Medical Physics (IOMP), I was appointed IOMP President at the International Congress on Medical Physics and Biomedical Engineering in Seoul, Korea last August. The IOMP covers some 16500 medical physicists around the world. Previously, I was President of the Asia-Oceania Federation for Medical Physics.

However, I became Acting-President a little sooner than expected because of the unfortunate absence of our President, Prof. Azam Nirmond-Rad. Azam was unable to attend for health reasons, and has since resigned from all her positions in the IOMP. Our best wishes go out to Azam, with the hope of a speedy recovery. The IOMP has developed in many ways under Azam's stewardship, and Azam has reported these initiatives in preceding issues of Medical Physics World. It's my job now to move on and to tell you of the challenges facing the IOMP, and how I expect to meet those challenges.

IOMP's first challenge is to ensure that all of its members, wherever they may be, have the same access to medical physics knowledge. This can only be achieved via the web site. The website should become the means of communication with all members; the major resource for treatment protocols, educational and training materials. The website must become the first resource for use by its members, supplanting Google!

IOMP should act as a promoter of leading edge and appropriate technology and missions, identifying and promoting new areas for research, particularly for the developing world. Far too great a fraction of our research is in the high technology, high cost end. This needs to be rectified to allow developing countries to benefit from Western R&D.

In the past, Medical Physics World (MPW) has been the main means of communication with the membership but has had a very low impact factor. What is the role of MPW in the e-era? Clearly, both soft and hard copies of MPW provide commercial sponsors

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Secretary-General's Report

Peter H S Smith PhD; Secretary General, IOMP

Name changes and terminology can represent merely changes in fashion but often reflect underlying shifts in focus or direction. In the early days of the application of physics to medicine various terms were used, often incorporating 'biological' along with 'medical'. The title of the journal 'Physics in Medicine and Biology' illustrates this. With the rapid increase of physicists working in hospitals the term 'medical physics' became dominant. However incorporating 'bio' in titles is now fashionable again, for several reasons. The emergence of genomics in the 1980's, with the resultant developments in molecular biology, has led to molecular medicine, developments in the design and delivery of drugs and a shift away from the more traditional areas of medical research to those focusing at the molecular and nano levels.

One of the most stimulating discussions involved this topic at IOMP was at the inaugural meeting of the International Commission of Medical Physics (ICom-MP) Committee, established jointly by IOMP and the International Union of Pure and Applied Physics (IUPAP). There are many physicists involved in research who would not consider themselves 'medical physicists' but who are making valuable contributions to the advancement of medicine and healthcare. It is vital that IOMP engages with these physicists and does not become an isolated body dealing only with hospital based clinical medical physics.

The importance of developing this type of link and of broadening our perspective as an organization is one of the themes of the IOMP document 'Review and Way Forward: 2006-20012' which was approved by Council at its meeting at the World Congress in August. The document does what its title states and it is available for down-loading at the IOMP website: (http://www.iomp.org/2006/Council/ReviewandWayForwardAugust2006.pdf).

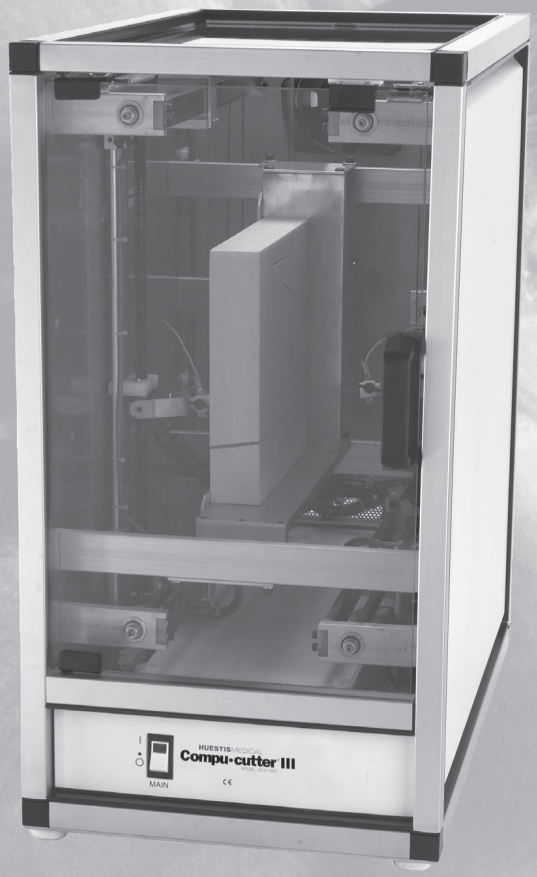
The document is intended to be regularly reviewed and updated to keep it relevant so that it can be used to guide all those involved in the activities of IOMP and to inform colleagues and other organization about the work, priorities and plans of IOMP. Comments, suggestions and ideas are always welcome.

It is vital that IOMP engages with these physicists and does not become an isolated body dealing only with hospital based clinical medical physics.

Council and Officers have now started a new three year period, finishing at the next World Congress in 2009 at Munich. There is an enormous amount to do (see the Review and Way Forward document) and we are planning to ask a greater number of medical physicists to become involved in the work of IOMP by contributing to specific projects or participating in the activities of working groups.

There were some valuable discussions at the two Council meetings at Seoul and the papers and draft minutes of these and notes of the EXCOM meetings are on the IOMP website–www.iomp.org.

Cutting Edge



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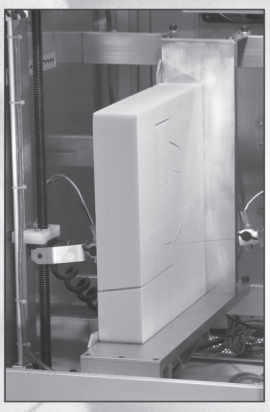

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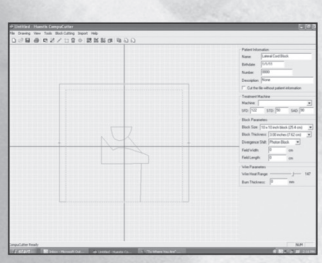

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About the IOMP Publications Committee

William Hendee, Ph.D., Chair, IOMP Publications Committee

The IOMP Publications Committee has been reconstituted under its new chair, William Hendee PhD. Committee members are the editors of several major medical physics journals. If we have overlooked an editor or a journal in the reconstitution process, please let the committee chair know. The committee members are:

- Alfonso Calzado (Spain) - Editor, Spanish Revista de Fisica Medica
- Martin Caon (Australia) - Editor, Australasian Physical and Engineering Science in Medicine
- Sally Clift (UK) - Editor, Medical Engineering and Physics
- Alberto Del Guerra (Italy) - Editor, European Journal of Medical Physics
- William Hendee (US) - Editor, Medical Physics
- Valery Kostylev (Russia) – Editor, Meditsinskaya Fizika(tehknika, biologia,klinika)
- Michael Mills (US) - Editor, Journal of Applied Clinical Medical Physics
- Kwan Ng (Malaysia) - Editor, Biomedical Imaging and Intervention Journal
- Ishmael Parsai (US) - Editor, Medical Physics World
- Ambika Pradhan (India) - Editor, Journal of Medical Physics
- Lothar Schad (Germany) - Editor, Zeitschrift fur Medizinische Physik
- Steve Webb (UK) - Editor, Physics in Medicine and Biology

One goal of the committee is to establish an electronic forum among editors to discuss shared editorial concerns such as author conflicts of interest, manuscript plagiarism and duplicate publication. Another goal is to share insights into emerging technologies and applications in the discipline of medical physics.

The committee serves as a resource to the officers and other committees of the IOMP, and will be pleased to consider publication issues and questions that are directed to it by IOMP members.

A responsibility of the committee is to identify individuals who will work with Taylor and Francis Publishers as referral editors for new manuscripts in the publishers medical physics and bioengineering series. The following individuals have agreed to serve in this capacity:

- [a] Kwan Ng (Malaysia) – University of Malaya
- E. Russell Ritenour (US) – University of Minnesota
- Slavik Tabakov (UK) – Kings College London

The Publications Committee will also work with the Editor of Medical Physics World to make the publication more helpful and informative to IOMP members.

Incoming President's Report

(continued from Page 1)

with an important advertising outlet. However, MPW must move to more topical reporting of new developments in medical physics.

It is important that IOMP stimulates the establishment nascent national societies, establishing contacts and providing real support for the formation of regional groups, for whom travel costs will be less, but which would fly the IOMP flag.

IOMP needs to be able to identify its key experts, so that it can quickly respond to national and international requests for comment in our discipline.

It is important to set objectives, and then work towards them according to an agreed time line. The "Review and Way Forward" document has been approved by Council and includes the following objectives:

- develop an interactive and knowledge based website,
- set R&D objectives to favour developing countries,
- increase membership of developing countries,
- increase effective placement of equipment and library donations,
- increase corporate sponsorship,
- increase the website hit rate by 20% pa.

We have a strong, dedicated team at IOMP and well established structures. Its time now to make the IOMP work for the benefit of our membership.

In conjunction with the International Federation of Medical and Biological Engineering (IFMBE), I was able to introduce a major new initiative relating to a joint task group of biomedical physicists and engineers under the International Union of Physical and Engineering Science in Medicine (IUPESM). This initiative relates to the implementation of appropriate technology and training in developing countries. The objective of this task group, called the Health Technology and Training Task Group (HTTTG), is to match the needs of these countries with appropriate technology, rather than impose the western model as may have been the case in the past. In so doing, the needs of the majority may be satisfied by low cost but practical and recommended solutions. The rather ambitious objectives are to:

- determine needs in developing countries,
- arrive at solutions to those needs,
- obtain funds to implement solutions.

The HTTTG will comprise consultants from developing and developed countries, and, hopefully, will be sufficiently balanced to ensure that real and practical solutions will be achieved. Please let me know if you wish to assist with both new ideas and active support.

Note: Professor Barry J Allen, PhD DSc, is the Director of the Centre for Experimental Radiation Oncology in the Cancer Division of St George Hospital, NSW, Australia. He is also Conjoint Professor in the Clinical School of the University of NSW and Professorial Fellow at the University of Sydney. His current research focuses on the development and implementation of a targeted alpha therapy (TAT) for melanoma, with some 30 patients participating in a phase 1 trial so far.

Report of the Scientific Committee

Cari Borrás, D.Sc., IOMP Science Committee Chair

The activities of the Science Committee (SC) during 2003–2006 included the organization of five symposia (the last three held during the WC2006 in Seoul Korea were a success); the co-sponsorship of two congresses, the endorsement of one workshop, the participation in various scientific events, the review of several scientific documents, and the initiation of a scientific database. The SC continued its commitment to strengthen the relationship between the IOMP and other international organizations, such as the International Society of Radiology (ISR), the International Commission on Radiological Protection (ICRP), and the International Atomic Energy Agency (IAEA. The Committee ensured a good rapport with the various IOMP Regional Organizations through the representatives of AFOMP, ALFIM, EFOMP and the AAPM, appointed to the SC Committee by their respective Chapter Presidents. Details of these activities have been reported in Medical Physics World on a continuing basis, and a summary was sent to the IOMP Council Delegates last August. The chair of the SC wholeheartedly thanks the members of the Committee for their hard work over the last three years, and hopes that the scientific database, which they started, can be completed soon, as it will be a useful tool for medical physicists in both industrialized and developing countries.

While maintaining the strong cooperation achieved with other international scientific organizations, the SC is now planning to expand its activities beyond the traditional diagnostic and therapeutic radiology fields and explore frontier areas in physics and biology and their impact on the principles of physics in medicine, emphasizing research within academic physics. The aim is to promote international cooperation in addressing the science needs of medical physics, including participation in the scientific programs of national organizations. To this end, the Committee is in the process of recruiting new members and developing a plan of work for the next three years.

A Report on World Congress on Medical Physics and Biomedical Engineering – 2006, Seoul, Korea

[1]Xie Nan-Zhu, and [2]Cheung Kin-Yin; [1]Guangzhou Medical College, Guangzhou [2]Prince of Wales Hospital, Hong Kong

Introduction

The World Congress on Medical Physics and Biomedical Engineering 2006 (WC2006) was held during 27 August and 1 September 2006 in the magnificent COEX Convention and Exhibition Centre in Seoul, Korea. It was held in conjunction with 6 international conferences, including the 6th Asia-Oceania Congress of Medical Physics (AOCMP), which is the official conference of AFOMP (Asia-Oceania Federation of Organizations for Medical Physics). The theme of WC2006 was "Imaging the Future Medicine". The meeting emphasized the importance and challenge of imaging in medicine. This is truly reflected by the number of plenary sessions assigned for imaging. Six out of ten plenary speakers gave their presentations on imaging or image-guided treatments. Two of the three major short courses organized were on imaging, one on PET technology, and one on image-guided radiation therapy. WC2006 is one of the largest scientific events for the medical physicists and biomedical engineers. More then 2600 participants from all over the world attended WC2006 in Seoul.

Scientific Sessions in Medical Physics

The scientific abstracts were presented in 25 scientific tracks, i.e. 6 physics tracks, 5 common tracks and 14 biomedical engineering tracks. The presentations in medical physics demonstrated significant achievement and progress made in techniques and technology by our physicist colleagues since the last Congress. In medical imaging, enormous advancement in equipment technology CT and PET-CT have been reported. Significant progress in molecular, biological, functional and interventional imaging with high field MRI and PET have also been reported. Professors ZH Cho of Korea and W. Kalender of Germany gave excellent reviews on these topics in their plenary lectures. The important role of imaging in radiotherapy was also emphasized by speakers in the radiotherapy tracks. Some excellent work had been presented on image guided radiotherapy. Encouraging progress had also been reported in areas such as portal dosimetry and application of Monte-Carlo techniques in radiotherapy dosimetry. In their plenary lectures Dr. P. Tripuraneni, President of ASTRO and Dr. Howard Amols gave good summaries on the current status and future directions of radiation oncology and radiotherapy physics and the importance of imaging in the future development of radiotherapy service.

Workshop on Medical Physics and Engineering Education and Training – A Global Perspective

The Joint IOMP/AFOMP Workshop on "Medical Physics and Engineering Education and Training- a Global Perspective" was an important event of WC2006. The one-day Workshop was a part of the 6th AOCMP and was jointly organized by Professor Slavik Tobakov of London University, UK and Professor Anchali Krisanachinda of Thailand. Professor Tobakov received the Harold Johns Award at WC2006 for his excellent work and contribution in medical physics education. There were 12 poster presentations and five oral presentations made by medical physicists from 14 countries around the world. The majority of the presentations were made by physicists from developing countries (according to UN classification), including Thailand, Philippines, Malaysia, India, Brazil, Estonia, and Indonesia. Well structured university programmes in medical physics at Master level have been established in these countries. However, formal and structured professional training for medical physicists has yet to be developed in most places. Dr. W.H. Round of the Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM) presented the education and professional training system in Australia and New Zealand and the accreditation program operated by ACPSEM for the medical physicists in these two countries. Dr. C.A. Lewis of Institute of Physics and Engineering in Medicine (IPEM), United Kingdom introduced the training scheme operated by IPEM for the medical physicists in the UK. Dr. KY Cheung reported on the residency training program for medical physicists in Hong Kong, China. Dr. Donald Mclean of IAEA presented the IAEA philosophy and approach on medical physics education and training. All these speakers emphasized the need of clinical training for medical physicists and the important roles of medical physicists in radiology and radiation therapy services and service development.

Symposium on Cooperation Strategy for the Development of Medical Physics in Asia

Another highlight of the 6th AOCMP was the Joint AFOMP/KSMP (Korea Society of Medical Physics) Symposium on "Cooperation Strategy for the Development of Medical Physics in Asia". Professor T.S. Suk of Catholic University, Korea and Co-Chair of WC2006, Professor K. Inamura of Osaka University, Japan and AFOMP President 2006/09, Professor K.H. Ng of University of Malaya and Chairman of SEAFOMP and Dr. Donald Mclean of IAEA were invited to report on their work and experience on the development of the medical physics profession in the Asian region. Dr. Donald McLean of IAEA reviewed the past, present and future work of IAEA in promoting the development of medical physics in the developing countries. He also introduced the materials and tools developed or being developed by IAEA for teaching and training purposes. He indicated that hospital physicists need to be competent in a diverse range of technical skills and importantly to see an integrated picture of the whole medical physics enterprise, in order to operate safely and efficiently. He

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World Congress (continued from Page 6)

mentioned that lack of recognition of the medical physics standards of practice is a common problem in many Asian countries and that accreditation processes, either national or regional through professional organizations could help to resolve the problems. He also reported that IAEA currently has projects running in Asia, Africa and Latin America that include competency based clinical training. IAEA recognizes the role of the professional societies in supporting the implementation of such projects, in such areas as mentoring, supervision and assessment of the physicists in training. During panel discussion of the Symposium, the need for the establishment of a formal definition on the roles and responsibility, a well defined education, and a formal structured professional training system are key elements in the development of the medical physics profession in developing countries.

> ...lack of recognition of the medical physics standards of practice is a common problem in many Asian countries...

Meetings of Asia-Oceania Federation of Organizations for Medical Physics

AFOMP held its Annual Council Meeting and Executive Committee Meeting during WC2006. Professor Kiyonari Inamura of Japan who was elected Vice-President during QC2003 in Sydney became the President of AFOMP while Professor Kwan Hoong Ng of Malaysia was elected Vice-President. Professor T. S. Suh of Korea and Dr. Anchali Krisanachinda of Thailand were re-elected as Secretary General and Treasure, respectively. The Council officially admitted Iran as its 17th member. The Council also endorsed that the 7th AOCMP be held in China in 2007. AFOMP awarded travel grants to 10 medical physicists from eight AFOMP countries to attend WC2006. A ceremony was held during 6th AOCMP to confer the awards to the recipients.

China to Host WC2012

One of the most important agenda in WC2006 was the bidding for hosting the World Congress in 2012. China was the only country who submitted a bid for WC2012. Professor D.P. Liu of China made an excellent presentation on China's proposal for hosting the event in Beijing. The proposal was very well received by all the delegates from different countries and was unanimously accepted by IOMP, IFMBE and IUPESM.

Conclusion

The World Congress 2006 was a complete success in many aspects. The organizers should be given full credit for putting up an outstanding scientific event. The meeting was successful in providing a platform for the medical physicists and biomedical engineers from all over the world to exchange their knowledge, experiences and ideas in clinical and engineering science. It also facilitated the officers and members of the international professional organizations to meet with each other and to work out their action plans for the years ahead. On the deficit side, the registration fee was relatively high. This might have been a repellent to many potential participants, especially those from the developing countries. The organizers of future World Congresses should take every possible measure to make the event affordable to more people.

Donation of Used Equipment – PRC Report for July–December 2006

Mohammed K. Zaidi, Program Manager, IOMP Professional Relations Committee

Varian Ximatron Simulator with x-ray and fluoro capabilities being donated by Mayo Clinic couldn't be shipped to the Institute of Radiotherapy & Nuclear Medicine (IRNUM), University of Peshawar, Peshawar Pakistan. It has finally shipped to Nile Badri Hospital and Medical Center, Department of Radiation Oncology, Cornish Elmaadi, Cairo, EGYPT. Dr. Eldesouky Abdulhakiem is the Medical Director. We are thankful for the efforts of Dr. Walter Tang and Patty Pickett of Mayo Clinic for this donation and help in making the arrangements for shipment.

Used equipment needed:

Treatment planning systems, Mevatron 67 linear accelerator, Theratronic, Automatic film processor, block cutter, patient dose monitor and ultrasound machine. A clinic in India is requesting for a HDR unit – if you want to donate one, please contact.

Shipping arrangements:

The institutions need used equipment should mention in their response that they would pay or make arrangements for shipping at a very short notice.

Dr. Ajai Kumar Shukla from India will be helping me in IOMP efforts to deliver quality service in getting and transferring used equipment from generous donors to those who need them badly. He can be reached at Department of Nuclear Medicine, SGPGIMS, Raebarelli Road, Lucknow (UP), 226014, INDIA. His phone number is 91-0522-2668700 extension 2615 and email address is akshukla@sgpgi.ac.in.

The equipment donated to IOMP Used Equipment Donation Program is generally in good working condition but we don't guarantee its usefulness. The donation of used equipment to IOMP are sometime tax deductible. IOMP will not be responsible for any warehousing expenses or loss if the used equipment donated couldn't be shipped.

If you want to donate or want some used equipment donated to your organization, please contact Mohammed K. Zaidi, Professional Relations Committee at our website www.iomp.org or email to zaidimk@gmail.com.

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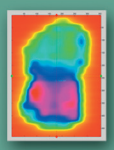
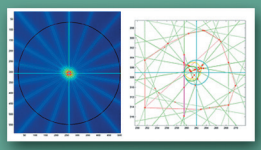
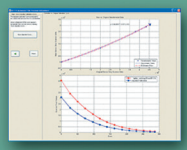
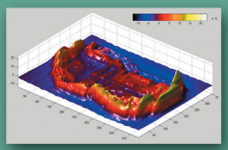
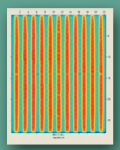

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Is there a Role for Hyperbaric Oxygen in Future of Radiation Oncology? – Part 2

John J. Feldmeier, D.O. and E. Ishmael Parsai, Ph.D., MPW Editor;
Department of Radiation Oncology, University of Toledo, College of Medicine, Toledo, Ohio, USA

Current Status of Hyperbaric Radiosensitization Trials:
Trials of hyperbaric radiosensitization for simultaneous external beam irradiation are essentially non-existent currently. The last large clinical trials were completed in the late 1970's. These trials were largely abandoned due to concerns of safety since the acrylic hull of hyperbaric chambers is subject to failure and even explosion as a result of accumulated radiation damage. Results of previous trials though positive even with the advantage of hindsight did not live up to the unrealistic expectations of the original investigators. Innovative techniques are also under study to deliver radiation and hyperbaric oxygen for enhanced tumor control.

Why have the previous studies in hyperbaric oxygen been discontinued?

a.) Patients selected for these trials typically had locally advanced tumors with a high likelihood of metastatic disease. Even enhanced local-regional therapy is not likely to impact on the survival of patients with already existing metastases.

b.) At least some of the trials resulted in higher complication rates decreasing the therapeutic gain. Similar results, i.e. increased control rates with higher complication rates are likely to be accomplished with simple dose escalation.

c.) Treatment through hyperbaric chambers, especially small acrylic ports, does not permit the multi-field targeted conformal radiation that has become the standard of modern radiation oncology. Reproducibility of setup absolutely requires that the radiation oncologist be able to position the patient precisely using 3 point laser fiducial marks. Modern radiation requires multiple intersecting ports, which are not practical when irradiating through a chamber especially one, which is predominately steel.

d.) Hyperbaric sensitization with time to "soak" in oxygen (typically 20-30 minutes) slows the throughput of busy radiation departments which schedule patients every 15 minutes. Recall that Churchill-Davidson required 40 minutes for each radiation portals, and modern radiation may require 6 or more ports per treatment.

e.) It was not clear whether the observed improvement in tumor control was due to the oxygen sensitization versus differences in radiation dosing schemes delivering high dose per treatment often in the hyperbaric group comparing the results with standard dose per fraction in the control group.

f.) Repetitive radiation exposure to acrylic ports or chamber hulls weakens the integrity of these materials leading to risk of explosion and rapid decompression. In at least 1 case, this weakening of materials led to rapid decompression with resultant death of the patient and attending physician (Pomeroy, personal communication).

g.) Oxygen mimetic, electron affinic chemical substances (the nitroimidazoles) became available and patients were entered into clinical trials at about the same time that interest in hyperbaric radiosensitization waned. The meta-analysis by Overgaard and Horsman also reviewed the results of sensitization by these oxygen-mimetic drugs. It appears that the outcome with these sensitizers are on par with hyperbaric oxygen sensitization in terms of improved local control. It is certainly easier to deliver a drug concurrently with irradiation compared to concurrent hyperbaric oxygen and irradiation.

h.) Additional strategies to overcome the resistance of hypoxic cells to radiation cell death have been investigated though none have been adopted into the clinic as yet. These include the application of artificial hemoglobin substitutes (the perflurocarbons) and the increase of the patient's own hemoglobin by administering erthropoietin. Another strategy to overcome hypoxic resistance to radiation cytotoxicity is the use of neutron beam irradiation. Neutron beam irradiation is high linear energy transfer particulate radiation and has very little dependence on oxygen since it effects cell kill by a more direct mechanism with little dependence on free radical intermediaries. Furthermore, at least 3 classes of drugs (the quinones, nitroaromatic compounds and n-oxides) have been identified which are hypoxia specific in their cytotoxicity. Clinical trials of these agents have really just begun, and no conclusions can be drawn in regard to their efficacy as yet. It is anticipated that these agents will be combined with radiation or chemotherapy to result in a synergistic result.

Innovative Approaches to Hyperbaric Oxygen Radiosensitization:

1. The concept of hyperbaric oxygen sensitization is based on a very valid radiobiolgic principle. The recent meta-analysis quoted above demonstrates that in the 17 trials reviewed, hyperbaric oxygen sensitization increased local tumor control when compared to the control group of patients treated in air. These trials have come to a screeching halt primarily because of the difficulties in logistics related to delivering hyperbaric sensitization and because with external beam treatments, modern techniques of radiation delivery are essentially

impossible. But!!! There are other ways to deliver a combination of radiation and hyperbaric oxygen and 3 of them that have had varying degrees of application will be reviewed.

a. **Hyperbaric Oxygen and MIBG:** Neuroblastoma is the most common solid tumor in children outside the CNS. Overall, it constitutes between 7 to 10% of all childhood malignancies. Neuroblastomas arise in the sympathetic nervous system and can occur in the abdomen, neck, chest or pelvis. Surgery is the primary treatment modality with a role for both chemotherapy and radiation if the tumor cannot be fully resected or has certain other negative prognostic signs. MIBG (Meta-Iodobenzylguanidine) is an analogue of the neurotransmitter norepinepherine. It selectively accumulates in tissues of neuroendocrine origin. The radioactive isotopic form (I131) has been previously used as a diagnostic tracer for imaging. Beginning in 1984, (I131)MIBG has been given for palliative treatment of chemoresistant neuroblastoma. In 1995, a group from Amsterdam (The Netherlands Cancer Institute) published their results in the treatment of children with recurrent advanced stage Neuroblastoma. Twenty-seven patients treated with HBO and (I131)MIBG from 11/89 to 3/94 were compared to a group of 36 patients treated with only (I131)MIBG from 2/84 until 5/90. Published survival for Stage IV recurrent neuroblastoma has been 0%. In this study, MIBG only resulted in a 12% 28-month survival; whereas, with the addition of hyperbaric oxygen survival at 28 months was 32%. Interestingly, two subsequent article from the same institution (Cornelissen et al, 1997 and Tygat et al, 1997) investigate in in vitro cell culture studies potential mechanisms whereby hyperbaric oxygen enhanced the effects of radioactive MIBG without even mentioning oxygen sensitization of radiation cytotoxicity. The Tygat paper showed no improvement in uptake or retention of MIBG in neuroblastoma cells as a result of hyperbaric oxygen. The Cornelissen paper shows decreases in cellular proliferation and energy metabolism and an increase in lipid peroxidation in the hyperbaric exposed cells. Obviously the administration of a radioactive isotope intravenously with subsequent exposure to hyperbaric oxygen is much more logistically feasible than simultaneous external radiation and HBO. The clinical protocol used by the Dutch group involved daily HBO treatments for 4-5 days beginning 2-4 days after the initial dose of 200 mCi (I131)MIBG.. Hyperbaric oxygen was given at 3.0 ATA in a very large multiplace hyperbaric chamber (Booerema's chamber) for 75 minutes at pressure.

b. **Radiation Given just after Hyperbaric Exposure for Malignant Glioma:** A Japanese group (Kohshi et al 1996, 1998) has reported initially on 9 patients and subsequently on 29 patients who received radiation for primary CNS malignancy just after a hyperbaric oxygen treatment. The first 9 patients were made up of 8 treated primarily and 1 with recurrent tumor. Hyperbaric oxygen was given for 60 minutes at 2.5 ATA followed by a 10-minute decompression. Patients were then taken to the radiation suite and the radiation dose was given about 15 minutes after decompression. The patients received HBO and radiation daily (5 days per week) for 20 to 30 treatments. These patients were compared to a non-randomized control group who received radiation only with a similar radiation dose scheme. The hyperbaric group had 4/9 patients with complete response and the rest had more than 50% regression of the tumor. This compares to no patients with complete response and only 4/12 with a partial response. In the updated series, fifteen patients treated with HBO were compared to 14 patients treated concurrently without HBO. It was not clear how patients were assigned to each group; the study was apparently not randomized. The trial took place at 2 different locations. Twenty-three of the HBO patients came from one institution and 6 from the other. The significance is that these 6 did not receive HBO until 30 minutes post HBO. Among the 23 who received HBO within 15 minutes 11 or 73% demonstrated at least 50% regression. None in the group of 6 who waited 30 minutes for HBO had a response. In the non-HBO group 4/14 showed some tumor regression. All patients were treated post operatively for residual cancer and all had chemotherapy (a nitrosourea) and steroids post-operatively and early on in their radiation treatment. In terms of survival all 4 responders in the non-HBO group had recurrence and all 14 patients were dead within 36 months of diagnosis (median survival 16 months). In the HBO group, median survival was 24 months. Six patients were still alive at the time of the report with a minimum followup of 66 months. The authors suggest that sufficient oxygen was available at 15 minutes (but not 30 minutes) for radiation sensitization. They suggest that oxygen washout is rapid in normal brain tissue but since gliomas typically use anerobic glycolysis for metabolism, that enough oxygen is retained for sensitization. A characteristic of brain tumors is frequent pronounced peri-tumoral edema. I believe an alternative postulated mechanism would be the reduction of this edema with enhanced circulation and improved oxygen tensions. Certainly both mechanisms are speculative, but I doubt that significantly enhanced oxygen levels remain due to the direct effects of HBO 15 minutes after decompression. Peri-tumoral

(continued on page 14)

MEDICAL IMAGING & RADIATION THERAPY

4D Dynamic Thorax Phantom

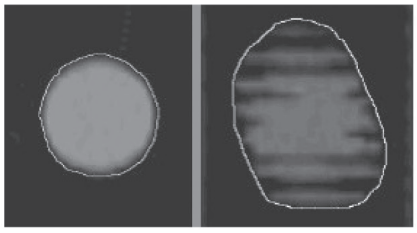
The Dynamic Thorax Phantom is designed to investigate and minimize the impact of organ motion and patient positioning errors in radiation therapy. It is the first commercially available dynamic QA phantom, developed for image acquisition, treatment planning, gaiting and dose delivery.

Major components of the dynamic system include a tissue equivalent thorax phantom, a precision motion actuator, and controller with 16 pre-set motion profiles.

Three-dimensional motion to the tumors in the phantom body is achieved by the actuator applying synchronized linear and rotational motion to a moving rod. Sinusoidal and other complex motions can be achieved with sub-millimeter accuracy and reproducibility.

The Thorax Phantom is manufactured from materials that mimic tissues within 1% from 50keV to 25 MeV. The phantom accurately represents average human thorax anatomy in shape, proportion and structure.

Tumors of different size, shape and density can be positioned within the lungs and means are provided for placement of various detectors directly within the tumor volume.



Stationary target

Same target with S/I motion amplitude of ± 5mm

The CIRS Dynamic Thorax Phantom proved a useful tool for quantifying the degree of volume aliasing in CT imaging of a moving target. The CIRS Dynamic Thorax Phantom proved a useful tool for quantifying the degree of delivered dose variation due to serial tomotherapeutic treatment of a moving target.

James A. Tanyi et al.
University of Texas Health Sciences
Cancer Therapy Center, San Antonio, TX
AAPM October, 2004 poster

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Editor's Corner

E. Ishmael Parsai, Ph.D., MPW Editor

This column is used to provide the MPW readers with some current news and information related to the fields of Medical and Health physics. Often list of references to review articles, useful websites, and summaries of current innovative advances will be provided. As always, your suggestions to enhance this column are welcomed. In addition, if you have other ideas or issues that you believe should be brought to the attention of MPW readers, please send them to Dr. Parsai the editor of the MPW at: Ishmael.Parsai@utoledo.edu.

NEW VACCINE COULD HELP YOUR CHILD AVOID CANCER

In the last few months, we have been hearing that Gardasil, manufactured by Merck & Co., is the first cancer vaccine which will be available soon. The claim is that immunization will protect girls and young women against human papillomaviruses (HPV) that cause cervical cancer. "For the first time, we have a chance to control a virus that is responsible for a significant amount of disease," said Bocchini, chairman of the American Academy of Pediatrics committee on infectious disease and an expert on HPV. More than 10,000 women are diagnosed with cervical cancer and 4,100 die each year in the United States. Around the world, cervical cancer is the second-leading cancer in women, causing 233,000 deaths annually. Here are some frequently asked questions about Gardasil's use, cost and availability.

Q) Who should get the vaccine?

The vaccine is recommended as part of standard immunizations for 11- and 12-year-olds, but can be given to girls as young as 9. The vaccine should be given to girls and women up to age 26, even if they have been sexually active. There is no reliable test to detect the HPV that can cause cervical cancer, so the vaccine is not recommended for women older than 26. It does not benefit a woman already infected by the high-risk HPV. The vaccine does not replace the need for regular Pap exams, which can identify abnormalities before they become cancer, said Bocchini, chief of pediatric infectious disease at Louisiana State University Health Sciences Center, Shreveport. Nor is it encouragement to become sexually active, as some conservative groups warned when the vaccine was first announced. "What we're going to be discussing with parents is not that we're expecting a child to become sexually active in the near future, but that we are protecting them from cancer," Bocchini said. "Most parents are not as concerned that HPV is a sexually transmitted disease as they are concerned about the consequences of HPV."

Q) When is the vaccine available?

Some pediatricians and clinics already are offering the vaccine. It will become widely available in US in November 2006.

Q) What does the vaccine do?

HPV is a sexually transmitted disease, affecting more than half of sexually active women. The viruses – about 30 are transmitted through sex – cause genital warts in women and men, but usually are symptomless and go away without any treatment. But longer infections by certain HPV known as "high risk" can interfere with normal cell growth, creating abnormalities that eventually can become cervical cancer. "There may be other co-factors that need to be in place, but it is necessary to have an HPV infection before someone is at risk for cervical cancer," Bocchini said. The vaccine protects against two viruses responsible for 70 percent of cervical cancer cases, and two viruses known to cause 90 percent of cases of genital warts.

Q) Are the associated costs of vaccine covered by insurance companies in United States?

The vaccine is $300 to $500 for the series of three shots, given over six months. Many insurance carriers are covering the vaccine as part of their normal benefit plans. But it is recommended that people check their individual plans to verify that immunization is included and whether they have a co-payment. The state Children's Vaccine Program will provide the vaccine to girls 9 to 18 who are eligible for the program – who are on Medicaid, who have no insurance, are Native American or Alaska Native. National health officials must find ways to make the vaccine accessible to those who don't have insurance and who don't qualify for government health programs, Bocchini said [original ref article: Vaccine 23 (2005) 2388–2394].

The following has been compiled by: Mohammed K. Zaidi, Member, IOMP Professional Relations Committee.

BREAST CANCER DRUG MAY PREVENT PROSTATE CANCER:

The hormonal drug, toremifene, sold as Acapodene used to treat advanced breast cancer might help prevent abnormal prostate growths from turning into cancer. It blocks some of the effects of estrogen, a hormone men also have in much smaller quantities than women. Men who took low doses of the drug, an oral selective estrogen modulator (SERM) for a year cut their chances of developing prostate cancer roughly in half. For decades, prostate cancer prevention and treatment has focused on blocking the male hormone, testosterone. Now it opens a new area to target estrogen. As many as 50000 men each year are diagnosed with such growths and had to have frequent biopsies to see whether cancer has developed [www.gtxinc.com/tech/pin.htm].

(continued on page 14)

Editor's Corner (continued from Page 13)

OPTICAL IMAGING OF PROTEASE ACTIVITY:

Optical imaging of protease activity for early detection of adenomas/adenocarcinomas in colitis were studied at Massachusetts General Hospital, Charlestown, USA by Umar Mahmood, M.D., Ph.D. and his colleagues as imaging biomarkers in animal models of colitis and adenocarcinoma development. In this technique, "smart" optical probes that increase their signal intensity many-fold after selective activation by cathepsin B are administered intravenously prior to intestinal surface imaging, which is analogous to endoscopy. They hypothesize that the degree imageable protease expression correlates with degree of dysplasia and cancer formation, and this overexpression may be imaged, even on the background of protease overexpression seen in inflammatory conditions such as colitis. Accomplishments may be divided into several broad areas: disease model system development, instrumentation advances, and the application of the two to evaluate neoplastic detection in the setting of colitis. It was observed that large bowel inflammation correlates with the near infrared signal generated by cathepsin B activation of "smart" fluorescent probes, confirmed with immunohistochemistry. They developed the first white light and near infrared fluorescence endoscope that allows true simultaneous white light anatomic images with molecular information reported in a separate channel, allowing direct information overlay, and advancing the previous work from excised bowel samples to repeatable, non-invasive determination of protease activity [Ito,S. 2001, Endoscopy 32/10, 849].

Hyperbaric Oxygen (continued from Page 11)

edema would take some time to re-establish itself, and this postulated mechanism seems to me to be more likely to explain the loss of enhancement at 30 minutes post-decompression (editorial remark). Regardless, these 2 papers present results suggesting that HBO sensitization (by whatever mechanism) persists long enough (at least in gliomas) after decompression to permit radiation to be delivered within a window of opportunity that lasts 15 but not 30 minutes. These findings certainly justify further investigation including application to other tumor sites and histologies. Malignant gliomas certainly are a good place to start with renewed interest in hyperbaric oxygen radiation sensitization considering 1) Their poor results with conventional treatment and 2) The unlikely possibility of metastasis beyond the radiation field.

A second group of researchers from Okinawa presented their results in irradiating 21 patients with grade 3 and 4 astrocytomas following surgery.17 Radiation was given within 10 minutes of exit from the hyperbaric chamber. This group also has demonstrated an increase in median survival. Fifty per cent of patients in a historic radiation control group survived 10 months while 60% of the hyperbaric group were still alive at 14 months. The Baromedical Research Foundation under the direction of Mr. Dick Clarke is poised to initiate a PhaseI/II trial using a similar approach in the treatment of head and neck cancers. This study will involve radiation delivered to patients immediately after leaving the hyperbaric chamber with the concept that residual oxygen will sensitize the tumor.

c. High Dose Rate or Permanent Sealed Source (Seed) or Radioisotope Brachytherapy

Feldmeier et al presented in abstract form (1996) a study to show the feasibilty of delivering brachytherapy using a high dose rate brachytherapy (HDR) unit through a chamber penetration while the chamber was compressed to pressure. In this report a standard applicator (Fletcher Suit) was placed in the chamber and connected to the high dose rate unit with the usual catheters which were placed through penetrations in the hull of a small animal hyperbaric chamber. The chamber was then taken to pressure and the high dose rate unit was programmed to step a single high activity iridium-192 source through the applicator dwelling at prescribed locations until the desired dose had been delivered to a simulated target. The source was then withdrawn into the machine into its storage tungsten shielded safe. The unit functioned just as it was programmed to do and should do the same if the applicator were placed into the patient. The advantages of this approach are multiple. The applicator localizes the dose, therefore there are no concerns in positioning the patient. The dose per treatment is high with HDR and the previous clinical trials with head and neck and cervix showed the largest advantage with high dose fractions. Brachytherapy is designed to give a very focused dose deposition; therefore, any oxygen-induced increase in normal tissue reactions should be minimized since only a very small volume of normal tissues receive a significant dose. (Remember that it was never clear that hyperbaric oxygen actually increased normal tissue effects.) Additional time needed to accomplish this treatment is unlikely to cause concern since the treatment is by nature time-consuming. The patient can be soaking in oxygen while the dosimetry plan is completed. Finally, concerns related to radiation damage to acrylic hulls will be minimized since even in an acrylic hulled monoplace chamber the source would travel through a penetration in the door or other metallic part of the chamber. Hyperbaric oxygen could also be given with

(continued on page 19)

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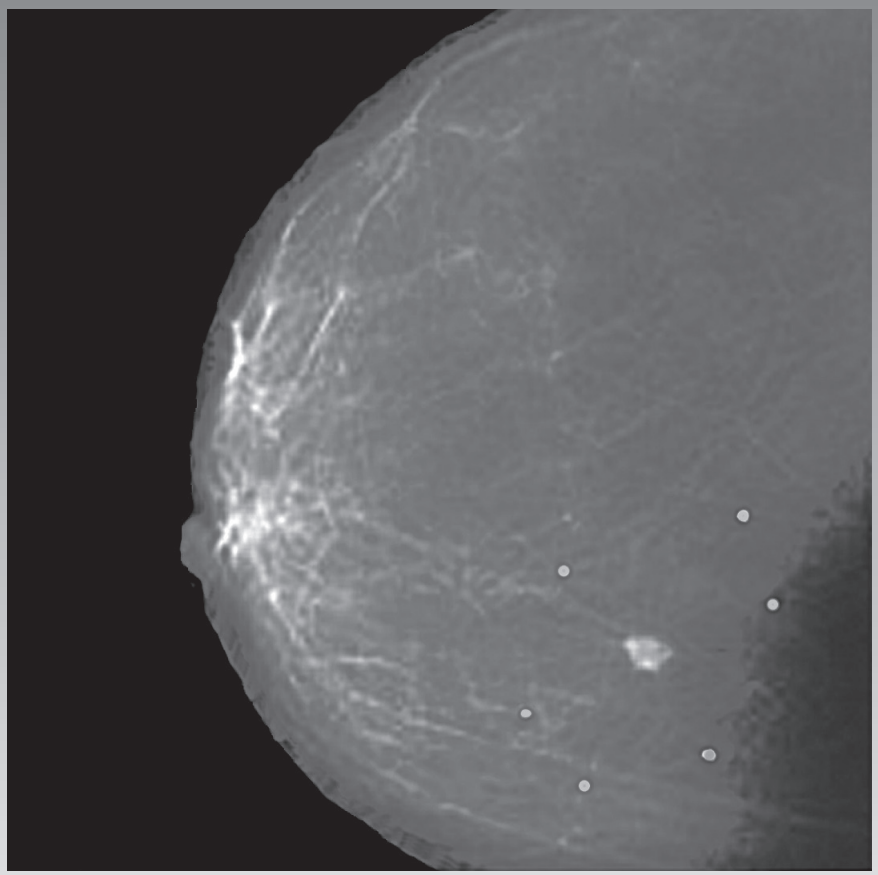

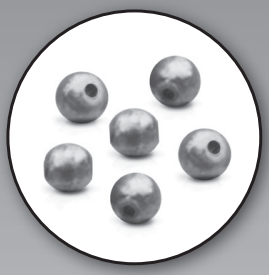

Fiducial markers for breast

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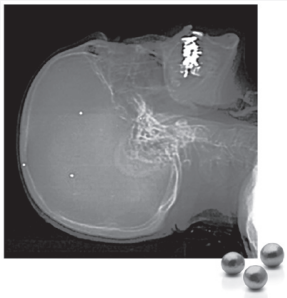

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IOMP Education and Training Committee - Short Report for the period 2003-2006

Slavik Tabakov, PhD, Chairman IOMP – ETC (2003-2006)

The IOMP Education and Training Committee (ETC) began its work immediately after the WC2003. The Committee followed the policies and rules accepted during the previous ETC terms and planned new actions for period ahead. ETC members (per region) were:

Dr Slavik Tabakov (EU and Eastern Europe) – ETC Chair

Dr Anchali Krisanachinda (Asia-Oceanic Region: Far East) – ETC Secretary

Dr Ana Cecilia de Pedrosa da Alzevedo (South America and Central America)

Dr Ye-Cho Huang, (China)

Dr Adel A. Mustafa (North America and Middle East)

Dr C.M. Pathak (India, Nepal, Pakistan, Bangladesh):

Dr Wynard J Styrdom (Africa), who unfortunately passed away during 2005.

During 2006 two new members were introduced to ETC (Dr C Lewis and Dr W Rae) to replace the outgoing members from Europe and Africa during the next period.

For this 3 years period ETC received 15 applications for Education and Training activities (coming from all regions above). From these 12 were approved (4 endorsed and 8 granted with financial support). All applications were processed by ETC through e-mail and submitted timely to the IOMP ExCom for final approval. All activities were successfully carried out. Each activity included 3 or more countries, while 5 activities were very large, each covering at least 10 countries. As an estimate, approx. 1100 colleagues have participated in these IOMP ETC activities. The overall budget of these was 16,000 USD. A chronological list of the approved activities follows:

1. Euro Conference on Medical Physics Training with EMIT e-Learning materials, Trieste, Italy, 2003, 9-12 Oct
2. Refresher course on Medical Physics in Diagnostic Imaging, Bangkok, Thailand, 2003, 13-14 Nov.
3. Course on Advances in Diagnostic Radiology and Nuclear Medicine Physics, Abu Dhabi, UAE, 2004, 20-25 March
4. Refresher Courses in Medical Physics, Rio de Janeiro, Brazil, 2004, 26-29 Aug
5. Current QA/QC Practice in Radiotherapy and Oncology, Bangkok, Thailand, 2004, 30-31 Aug
6. Intensity Modulated radiation Therapy Delivery systems, Patient's benefits & Radiological Safety, New Delhi, India, 2004, 28-31 Oct
7. Continuing Professional Development of Medical Physicists" of Russia and neighboring Countries, Moscow Russia, 2005, 21-24 June
8. Current Practices and Advances in Radiation Therapy Physics, Manila, Philippines, 2005, 1-5 Aug
9. Training course on medical physics, radiation therapy, nuclear medicine, diagnostic and medical imaging, and radiation safety, Yaounde, Cameroon, 2005, 7-12 Nov
10. Cyclotron PET-CT, New Delhi, India, 2006, 15-16 July
11. Workshop Medical Physics Education and Training - a global perspective, Seoul, South Korea, 2006, 28 Aug
12. Course on Advances in Radiation Therapy: IMRT and Images applications, Buenos Aires, Argentina 2006, 22-25 Sep

Additionally to the above two Poster session on Education and Training were held at the ICTP International Medical Physics College in Trieste, Italy with representatives of 30 countries (during 2004 and 2006). Also, in 2004 the Medical Physics e-Learning project EMIT received the inaugural EU prize for education – Leonardo da Vinci Award.

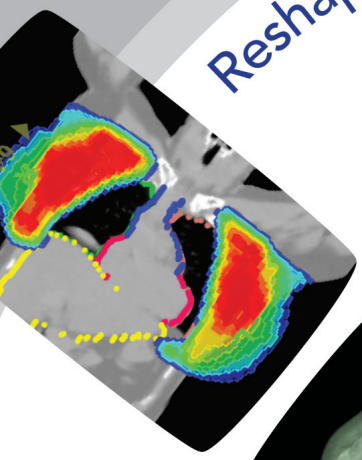
During this period ETC was involved in the IAEA discussions for their new educational web site, and also participated at the International Conference Physics and Sustainable Development (Durban, South Africa, November 2005). At this important Conference (supported by IUPAP and IOMP) one of the 4 main development areas for Physics was named as Medicine. As a consequence from the Conference ETC is currently working on the development of a Model Curricula for Postgraduate courses and have initiated the formation of a Validation/Accreditation Panel to develop the criteria for future IOMP validation of courses (the Panel will be chaired by the past-ETC Chair - S. Tabakov).

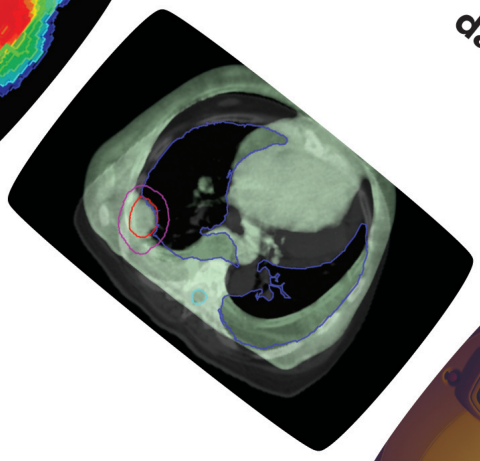
The last activities in the period March–October 2006 were a successive course on Cyclotron PET-CT, organised in India, New Delhi (July, 2006); a course on Advances in Radiation Therapy: IMRT and Images applications, organised in Buenos Aires, Argentina (September, 2006) and the satellite to WC2006 ETC Workshop Medical Physics and Engineering Education and Training - a Global Perspective (Seoul, South Korea, August, 2006). The last activity attracted 22 presentations from countries in Asia and other IOMP regions. These will be combined in a booklet, together with other similar presentation collected during the last 3 years, and will be published during 2007.

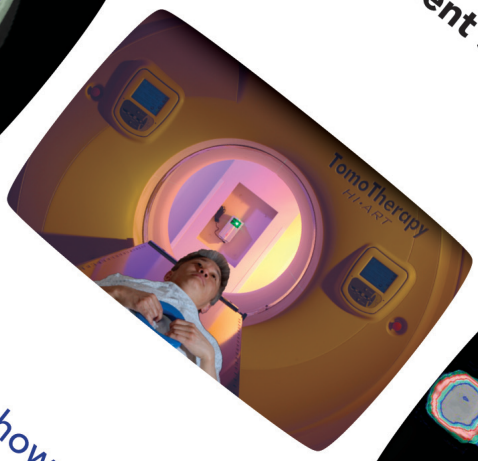
This month IOMP was successfully included in a new EU educational project (EMITEL – 2006-2009) – aiming to develop a multilingual encyclopaedic dictionary in Medical Physics.

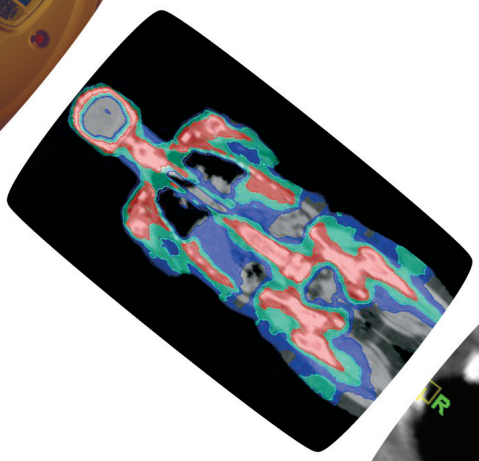
At the end of this short report, I would like to thank all IOMP ETC members for their hard and dedicated work during this period. Having been Chair of the ETC for 2 periods I am stepping down, but will continue my work in the ETC at the Validation/Accreditation Panel. To ensure the continuation of the successful work of ETC, our ETC Secretary (Dr Anchali Krisanachinda) is now appointed as the new ETC Chair for the next period 2006-2009. I wish every success to the new team of the IOMP ETC.

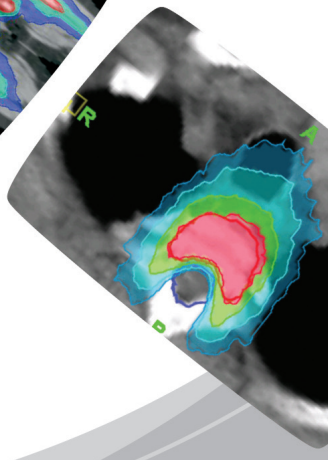
Reshaping Radiation Therapy











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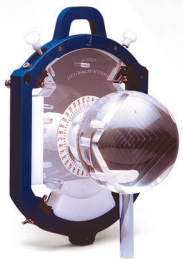

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Hyperbaric Oxygen (continued from Page 14)

radioisotope therapy such as intravenous doses of Samarium and Strontium given for blastic bone metastases or radioactive iodine given for thyroid cancer in a similar fashion to the MIBG experience. Permanent implants such as Iodine125 seeds could be sensitized with hyperbaric oxygen, but intuitively this would not seem to be useful since it takes a full year of radioactive decay to deliver the dose with I125. Obviously, radiation safety regulations must be considered for any of these applications. For HDR, given the activity and energy of the radioactive source, the treatment would have to occur in the radiation oncology department with appropriate shielding and with the patient monitored by closed circuit TV.

V. Summary

Oxygen radiosensitization is a well-established principle of radiobiology. Efforts continue to be put forward to apply this principle in the clinic for a therapeutic advantage. We have reviewed the mechanisms and the clinical experience to date. Even some 25 years later, on review it appears that there was a demonstrable advantage for HBO sensitization of external beam treatment and that these studies were prematurely abandoned. A few novel approaches have been recently investigated and deserve further study. Hopefully, new clinical trials will be developed which will overcome the previous difficulties and design shortcomings to answer the question with good scientific effort.

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Calendar of Events

Carter Schroy, Ph.D., MPW Associate Editor

The following events can be found on the online calendar of the journal "Medical Physics" at http://medphys.org/calendar. Please email your international events to the Calendar Editor, Carter Schroy, at EventsEd@aol.com for inclusion in MPW. Deadlines for MPW are April 1 and October 1 for issues that are mailed several weeks later.

23-25 February 2007

First Int'l Symposium on Stereotactic Body Radiation Therapy and Stereotactic Radiosurgery; Cleveland, OH USA

http://cms.clevelandclinic.org/neuroscience/body.cfm?id=98"
email: tobinm@ccf.org

26-29 March 2007

International Workshop on Monte Carlo Codes and the13th UK Monte Carlo User Group Meeting (MCNEG 2007); Teddington, UK

http://www.npl.co.uk/ionrad/training/montecarlo/

29 April - 1 May 2007

28th Annual Meeting of the American Brachytherapy Society; Chicago USA

http://www.americanbrachytherapy.org
email: guggolz@drohanmgmt.com

25-29 May 2007

American College of Medical Physics Annual Meeting; Baltimore USA

http://www.acmp.org

4-7 June 2007

XVth Int'l Conference on the Use of Computers in Radiation Therapy; Toronto, Canada

http://www.iccr2007.org

22-26 July 2007

American Association of Physicists in Medicine 49th Annual Meeting; Minneapolis USA

http://aapm.org/meetings
email: aapm@aapm.org

24-28 September 2007

Regional an Global Aspects of Radiation Protection; Brasov, Romania IRPA Regional Congress for Central and Eastern Europe

http://www.irpa2007romania.com
email: irpa2007@ispb.ro

19-24 October 2008

12th International Congress of The International Radiation Protection Association (IRPA); Buenos Aires, Argentina

http://www.irpa12.org.ar/
email: irpa12.committee@gmail.com

Status AAPM/IOMP Libraries – October 2006

Allan Wilkinson, Ph.D., IOMP Curator of Libraries

We currently have 75 active libraries in 43 countries (see list below). Active status is maintained by returning an update questionaire every 2 years. The 2006 questionaire was emailed to 73 libraries and a paper version sent by airmail to the remainder. Response to date has not been encouraging and efforts are in place to contact the large number of libraries which did not return a questionaire. In the past year there have been private donations of journals/books/reports to Brazil, India, Iran, Pakistan, and Sri Lanka. Several more donors are waiting for suitable libraries. Subscriptions to Medical Physics have been donated by AAPM members over the years. It seems that there now also exists the possibility of free subscriptions courtesy of the IOMP. Current issues of journals along with standard textbooks (newest version not necessary) are what most libraries appear to want. Anyone knowing of sites with an interest in establishing a new library should contact the curator (iompl@aapm.org).

Active Libraries

Algeria, Argentina, Brazil, Brunei, Bulgaria, Cameroons, China, Columbia, Costa Rica, Cyprus, Dominican Republic, Ecuador, Egypt, Estonia, Georgia, Hungary, India, Iran, Jamaica, Kenya, Lebanon, Mexico, Morocco, Myanmar, Namibia, Nepal, Nicaragua, Nigeria, Pakistan, Peru, Philippines, Poland, Russia, Sri Lanka, Sudan, Tanzania, Thailand, Tunisia, Turkey, Ukraine, Vietnam, Zambia, Zimbabwe.

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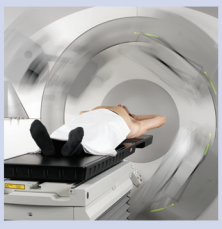

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Message from the past president

Prof. Azam Niroomand-Rad, PhD

In my last message, I would like to express my deep appreciation to all my colleagues who supported me during the past several months as I navigated some difficult personal matters. Even though I have not been able to thank each of you individually, your comments and concern were cherished.

I would also like to express my sincere regret for not being able to attend our Triennial World Congress (WC-2006) in Seoul, Korea. I am grateful to all of my AAPM (American Association of Physicists in Medicine), IOMP (International Organization for Medical Physics), IUPESM (International Union for Physical and Engineering Sciences in Medicine), IUPAP (International Union for Pure and Applied Physics), and IAEA (International Atomic Energy Agency) colleagues who adjusted the Congress program accordingly despite minimal advance notice.

Lastly, I would like to thank all of you for your time and energy in advancing the mission and goals of our organization for the past six years. As outlined in my last President's Message (MPW, Vol. 22, Number 1, Page 1, June 2006), we have taken many initiatives from WC-2000 (Chicago, USA) to WC-2003 (Sydney, Australia) to WC-2006 (Seoul, Korea). Given our membership's dedication to improving the practice of medical physics worldwide, I am confident that our organization will continue to make great strides under the leadership of President Barry Allen. I wish you all personal and professional success as we march forward to WC-2009 (Munich, Germany) and beyond.

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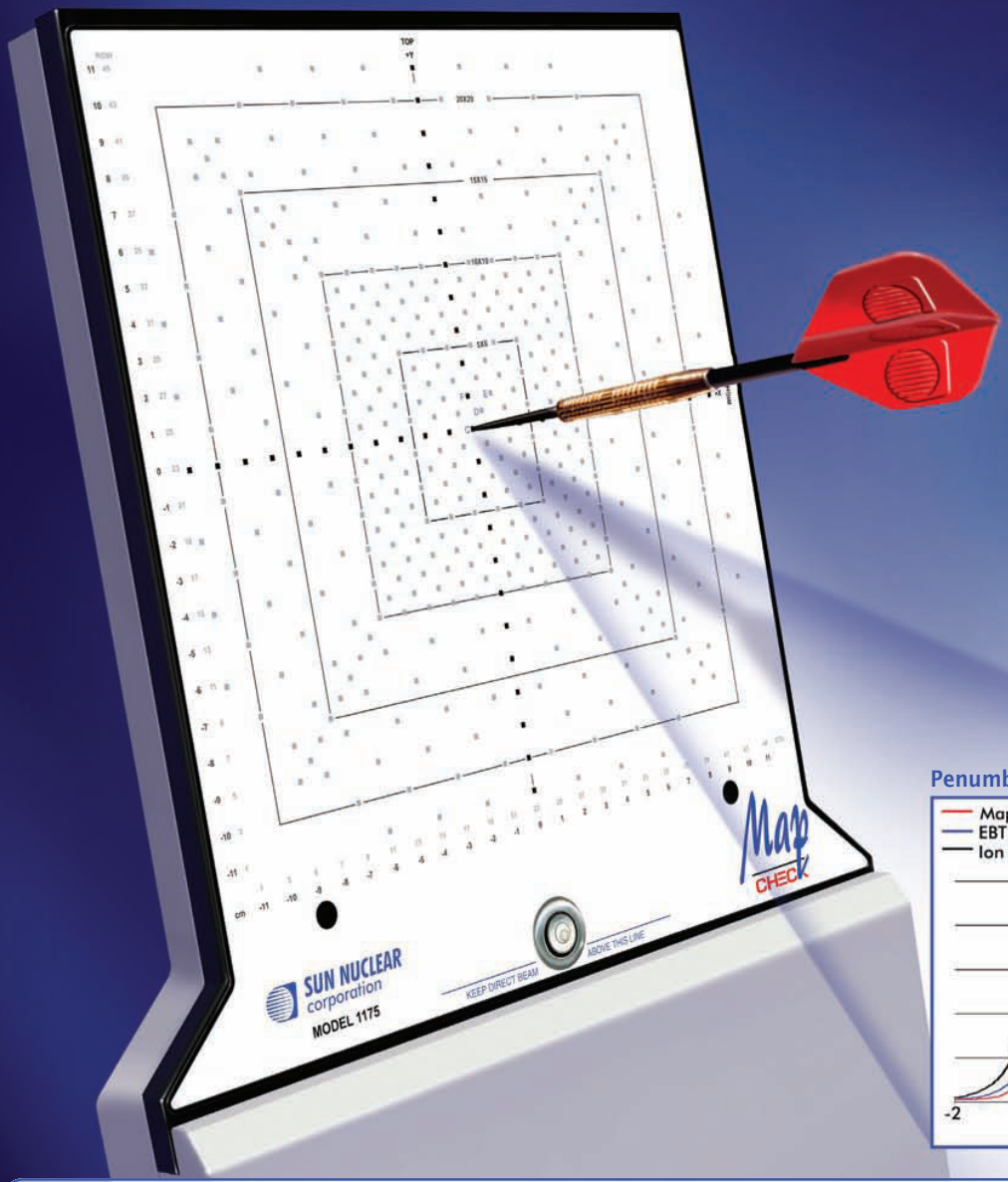

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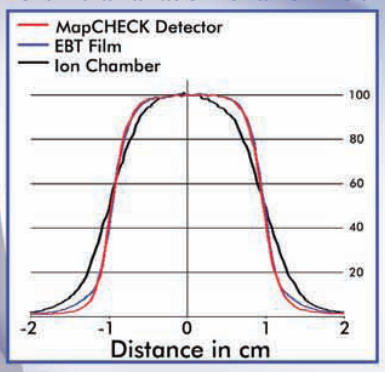

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