ktpl
Technology from the frontiers of medical science

Share & Care

Vol. 1 No. 4 April - June, 2010

We Share ...

We are out with yet another issue of Share & Care.

This issue features an interview with a legend named Prof. (Dr.) K. A. Dinshaw. She has not been only a witness but also an active participant in continually educing landscape of radiotherapy with emerging newer technologies. We sincerely salute the persona which always stood out by virtue of her conduct and commitment.

Share & Care also feature an article on potential of Co-60 based external beam therapy system which occupies an important place in our radiotherapy armamentarium. This lead article discusses clear feasibility of an external beam system utilizing cobalt-60 as the radiation source for sophisticated tight margin therapies with accessories which were exclusively reined by linear accelerator technologies thus far. Our Principal, Best Theratronics, is championing MLC and flat panel image guidance technology for its new tele-cobalt system. We see cobalt therapy experience of a completely new kind is in store by advent of this development.

Our commitment to value delivery to medical fraternity will make KTPL worthy of being one of most admired companies in our country. 'Share & Care' essentially forms a small part of this endeavour.

With best wishes,

Amardeep Sethi
C.E.O.

TomoTherapy Installs 300th Hi-Art ® Treatment System Worldwide

TomoTherapy Incorporated, creator of advance, integrated radiation therapy system for cancer care, announced the 300th worldwide installation of the Hi-Art® treatment system at Ospedale Regionale Umberto Parini, Italy.

Fred Robertson, TomoTherapy CEO said "We are honoured that Ospedale Regionale Umberto Parini selected TomoTherapy as their partner for establishing its radiation oncology programme, and are confident that patients will benefit greatly from the availability of this technology."

"Congratulations TomoTherapy Inc. and their Indian associates KTPL for touching the 300th TomoTherapy installation milestone. In the near future, we will also be joining the league of the prestigious TomoTherapy treatment centres and we trust that this unit will provide state of the art radiotherapy for cancer patients in India."

Dr. Mammen Chandy,
Director
Tata Medical Centre, Kolkata

Cobalt-60: An Old Modality, A Renewed Challenge

Dr. Jake Van Dyk **Dr. Jerry J. Battista**

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1. INTRODUCTION

In recent years, several reports have considered various issues which define the "optimum" photon energy for the treatment of malignant disease.

By putting "all the cards on the table", the cobalt-60 option will be viewed from a fairer perspective than we have seen in recent years of rapidly advancing accelerator technology. A few recommendations are made for the designers of cobalt-60 technology so that modernized units can be made more attractive for today's radiation therapy facility.

2. LINEAR ACCELERATORS VERSUS COBALT-60: ISSUES FOR COMPARISON

To summarize issues for comparison for the use of cobalt-60 versus linear accelerators; these issues are not listed in any order of priority although they are broadly categorized according to radiation beam characteristics, machine characteristics, safety considerations and, finally, cost considerations. Different levels of importance can be assigned to each of these factors according to the local practice of radiation oncology in a cancer centre.

2.1 Radiation Beam Characteristics

2.1.1 Beam edge sharpness (penumbra)

(a) Issues for Consideration

One of the strongest arguments against cobalt-60 has been the unsharpness of the beam edge or its large penumbra. This is generally manifested by the distance between the 80% to 20% or the 90% to 10% doses at the edge of the beam. Sample data have been published by various authors.

It is important to note that there are sizeable differences between penumbras. These are strongly dependent on both the depth of measurement in water as well as dosimeter type and size. It is clear that for cobalt-60, the penumbra widths increase with source diameter (e.g. 1.0 cm to 2.0 cm), the distance between the source and the bottom of the field definer, and the distance between the field definer and the patient. The x-ray beams from linacs, on the other hand, offer penumbras which are only mildly dependent on geometry due to the small source focal spots (e.g. 0.1 cm to 0.3 cm). However, with increasing x-ray energies, the beam edge is blurred by more energetic electrons scattered in tissue over a greater lateral range. The effective penumbra achieved in the patient is thus significantly enlarged compared with a pure geometric penumbra, and it cannot be reduced by machine design.

There are at least four other major considerations that should be incorporated in the penumbra criterion for comparison although little quantitative data exist for these considerations.

The first has to do with the radiation oncologist's ability to define target volumes accurately or consistently. The need for very precisely defined field edges is based on the assumption that target volumes and normal tissues can be defined with a high degree of accuracy. For some normal tissues and with appropriate imaging data, this assumption can be valid. However, for the accuracy of definition of planning target volumes, very little data exist. A recent study by Leunens *et al.,* comparing the variability of 12 physicians defining target volumes of 5 different patients with brain tumours, indicated that the estimated tumour and target sizes varied by factors of 1.3-2.6 and 1.3-2.1, respectively. Maximum variations were of the order of 1.1 to 2.7 cm in the cranio-caudal direction and 1.4-2.1 cm in the fronto-occipital direction.

The second consideration has to do with patient motion. Our desire for a tight penumbra is reasonable only if a narrow treatment penumbra can be maintained in clinical practice. However, in reality, patients undergo 20 to 30 fractions for radical therapy and usually 5 to 10 fractions for palliative therapy. As a result, the sharpness of the dose delivered to the patient is strongly dependent on the reproducibility of the patient setup relative to the beam. With the recent developments in portal imaging, it is now well recognized that setup reproducibility is typically of the order of 0.5 cm for head and neck patients (up to 0.7 cm in Michalski *et al.*) while it is about 1.0 cm for pelvic and thoracic treatments (up to 1.4 cm and 1.2 cm, respectively in the data of Michalski *et al.*). The impact of this will be to blur the edge of the beam with respect to tissue elements near the beam edge. The net result is that even a "perfect" penumbra (i.e., a step function with "0" penumbra width) will be smeared out by beam placement uncertainty.

The third consideration has to do with organ motion. Various authors have shown that prostatic motion of up to 3 cm can occur mostly in the anterior and/or superior direction. Similarly, bladder treatments involve large changes in bladder and rectal diameters. Thoracic studies have shown substantial tumour movement (-1.5 cm) as a result of cardiac and respiratory cycles. Similarly, in head and neck treatments, gross tumour volumes can change during a 6 week course of treatment. The net result is that our ability to reposition the involved tissues is severely limited by both a "moving target" within the patient as well as our ability to reposition the patient from day to day.

A fourth consideration takes a different perspective and has to do with the biological response of the irradiated tissues. The responses of the irradiated cells generally have a sigmoidal dose-response relationship. Tumours and normal tissues behave similarly although with different dose sensitivity and slopes to the curves. These dose-response curves can be characterized by the slope at the 50% response level {often parameterized by the contrast figure, $_{50}$ = (%change in response) / (%change in dose)}. While there are large variations in gamma, dependent on tumour or normal tissue type, it is not unreasonable to produce a 10% change in response by a 5% change in dose, i.e., $_{50}$ = 2. The net effect of this is that even a large geometric penumbra of 1.6 cm as might be found on a conventional cobalt-60 machine, could have a "biological penumbra" that is twice as steep as the physical penumbra. Of course, these biological considerations are much more complex because they depend on the dose level (i.e., in which portion of the dose-response curve) and they could involve partial volume effects for the tumour and normal tissue compartments.

In summary, our usual simple preference for sharp physical penumbras is intuitive but it should be extended to consider the reality of non-reproducible patient setups as well as the biological considerations which greatly accentuate the biological penumbra.

(b) Opportunities for Improvement

While the above considerations question the need for ultra-sharp physical penumbras, there are still opportunities for improving the beam sharpness for cobalt-60 since the penumbra on a cobalt-60 machine is primarily dependent on geometric considerations. Both source size and source-to-collimator distances are adjustable parameters. A redesigned modern cobalt unit could incorporate multileaf collimators and dynamic wedges thus minimizing the need for trays for ancillary devices and thereby allowing a larger distance between the source and the field defining apparatus. Furthermore, is it not possible to redesign source capsules such that similar effective activities can be contained within smaller source diameters? We recognize the simplicity of our comments. However, there has been very little effort on improving the design of cobalt-60 units since their original design.

2.1.2 Beam Penetration (Energy)

(a) Issues for Consideration

The benefits of an increase in energy have been well documented. Often this is reviewed from the point of view of depth dose fall off for single fields, or comparing the ratio of the dose at the depth of maximum dose to the midplane dose for parallel-opposed fields, or by considering the integral dose for typical multiple field treatments. However, other factors must be incorporated into this discussion as well. For example, when there are superficial nodes to be treated as occur in head and neck or Hodgkins disease, or superficial target volumes as in breast cancer patients or in total body irradiation for bone marrow transplants, then it is important to consider also the build-up depth for a parallel opposed pair of fields. For example, for cobalt-60 (10x10 cm^2 field, patient thickness 25 cm), the 95 % depth occurs at about 0.3 cm, for 6 MV x-rays at 0.7 cm and 25 MV x-rays at 1.8 cm. These data suggest that the choice of energy is strongly dependent on the "shallowness" of the target volume relative to the skin surface. Simple generalizations based only on deeper target volumes could lead to inappropriate conclusions. Laughlin *et al.* produced a figure indicating their best estimate of optimum choice of energy *versus* treatment site. However, Suit in an editorial on their paper indicated that appropriately fitted cobalt-60 units could be "fully acceptable in the treatment of a large majority of the patients undergoing radiation treatment for carcinoma of the head-neck region, breast, and sarcomas of soft tissues of the extremities". The trend today is towards conformal therapy with segmented or moving field techniques. Generally, this requires multifield irradiation or the use of arc/rotation therapy. As the number of fields increase, the advantage of higher energies over cobalt-60 radiation decreases as manifested in the dose distributions and in integral doses. A simple calculation of dose at the depth of dose maximum compared to the isocentric dose for an increasing number of fields illustrates this issue. Table 1 shows a 186% difference in these doses (relative to the prescribed dose at the isocentre) for a single field technique when comparing cobalt-60 and 18 MV x-rays but demonstrates only a 7% difference when the number of fields is increased to 20.

(b) Opportunities for Improvement

Today there is a tremendous amount of technological development in making conformal therapy techniques aimed at linear accelerators. On a lesser scale of developmental activity, related technology has also been implemented using a cobalt-60 tracking unit. However, this technology has never been adequately commercialized to make it readily available. Cobalt-60 units could be enhanced with the application of multileaf collimators and moving field hardware/software to provide dose distributions that would be very comparable to those provided with higher energy radiations.

Table 1 - Comparison of the dose at depth of maximum dose (in %) to the dose at the isocentre (100%) as a function of number of fields. Depth to isocentre = 20cm (equivalent to a lateral patient thickness of 40 cm). Field size is 10x10 cm^2, SAD= 100cm.

Number of fields	Cobalt-60	6 MV	18 MV
1	390	284	204
2	206	159	126
4	99	79	63
6	66	53	42
10	40	32	25
20	20	16	13

2.1.3 Scattering conditions/dose uniformity

(a) Issues for Consideration

While rectangular fields generally provide reasonable dose uniformity, fields with a large amount of shielding will have altered photon scattering conditions resulting in greater dose variation throughout the volume as a result of photon scatter. Generally, an increase in photon energy will result in more forwardly directed scatter, yielding a more uniform dose distribution within a shaped field. Accelerators generally provide more uniform field flatness in comparison to cobalt-60 machines, and uniformity is less prone to changes in scattering conditions.

(b) Opportunities for Improvement

First, the field flatness for cobalt-60 machines could be improved by the incorporation of flattening filters. Secondly, complex irregular fields could have their dose uniformity improved by the additional use of dose compensators. Such compensation is complex but can achievable with a three dimensional dose computation system.

2.1.4 Contour/inhomogeneity corrections

Under conditions of electron equilibrium, the magnitude of both contour and inhomogeneity corrections decrease with increasing energy. Thus, from this perspective, higher energies are advantageous since the beams are less affected by tissue density and air gap. However, with increasing energies above 10 MV, issues related to electron transport and disequilibrium must also be considered. It is now well recognized that inhomogeneity corrections for the higher energy photon beams in low density, lung-type media are strongly affected by the lack of electron equilibrium. These effects are not computed accurately on most commercial treatment planning computers. Often, for small fields and low density tissues, where an increase in dose is predicted, the effects of electron transport actually result in a decrease in dose. Furthermore, this effect manifests itself at the edge of any field with an increase in physical penumbra. This was quantified by Ekstrand *et al.* who showed that the ratio of penumbral width in lung to that in water magnifies from about 1.0 with 4 MV x-rays to about 2.5 with 18 MV x-rays. Indeed, some institutions limit thoracic treatments to machines with less than 10 MV x-rays to minimize the perturbation effects of the electron disequilibrium.

Interface effects are directly related to the above discussion on inhomogeneity corrections. These interface effects are manifested at the edge of small air cavities, at bone-tissue interfaces, and at the interfaces of metallic prostheses as might occur in mandible reconstructions or hip prostheses. Generally, in these situations, cobalt is the preferred choice of energy since the volume of tissue under-dosed or over-dosed is smaller with cobalt than it is with the higher energies.

2.1.5 Dose to bone

The dose to bone compared to the dose to soft tissue is often given by f_{bone}/f_{tissue}. For the higher energies, an average stopping power ratio of tissue to bone is further incorporated into the numerator. Usually, these values have been quoted for the primary beam photon spectrum. However, Cunningham *et al.* have shown that photon spectra change with depth and field size in the patient due to multiple scattering of photons. While conventionally, the dose to bone relative to the dose to tissue is thought to increase from 1.03 in cobalt-60 to 1.07 for 18 MV primary x-rays, Rawlinson showed that for a 20x20 cm^2 field at a depth of 10 cm, the corresponding values are 1.08 to 1.07, respectively. Thus, there is no significant difference in dose to bone relative to dose to tissue when comparing cobalt-60 to higher energy x-rays at depth for conventional field sizes. For very large fields, as encountered with total or half body photon irradiation, the increase in multiple scatter for cobalt-60 could result in a substantial increase (-10%) in the dose to bone compared to higher energy x-rays. For total body irradiation, where irradiation of blood forming tissues is intended, the use of cobalt-60 could, indeed, accentuate the dose to bone and serve as an advantage.

2.2 Service/Maintenance Issues

Practical experience at the Princess Margaret Hospital has shown that the average down time for a cobalt unit is less than 1% while the down time for linear accelerators increases with increasing complexity from about 3% for a single low energy unit to about 11% for the 25 MV type machine. Similar data was quoted by Das and Kase who observed a 3% down time for a 4 MV machine compared to about 5-7% for higher energy units. Our own data, at the London Regional Cancer Centre, demonstrate similar trends although with lower down times during clinical hours. For the higher energy machines, the clinical down time is about 3%, for single low energy linacs it is about 2%, and the cobalt unit has a down time that is less than 0.4%. However, to consider overall costs, the after hours preventative maintenance time should be added. In our centre, this corresponds to another 3% and 1% of clinical hours for linacs and cobalt, respectively. Of course, the expertise of maintenance staff required is directly related to the complexity of the treatment machines and this affects the maintenance costs accordingly.

2.3 Safety Considerations

2.3.1 Pacemaker concerns

An increased number of patients are seen in radiation therapy departments with implanted pacemakers as a result of an aging population combined with increased indications for the insertion of permanent pacemakers. Pacemaker faults are potentially generated either by interference due to electromagnetic radiation or by ionizing radiation. The level of concern for both of these is controversial. Conservative recommendations by an AAPM Task Group suggest close monitoring of patients treated on linear accelerators to observe any potential effects of electromagnetic interference and maintaining total dose levels to pacemakers to less than 2 Gy. In England, where no formal recommendations regarding the use of pacemakers have been adopted, a survey indicated that about one-half of the radiation therapy departments treated their patients with pacemakers on cobalt units in preference to linear accelerators.

3. CONCLUSIONS

In conclusion, cobalt-60 can still be regarded as a very viable and cost effective option for the treatment of a sizeable fraction of cancer patients assuming that the technology is improved. In times of economic restraint, it becomes even more important to strike a delicate balance between the use of accelerators and cobalt-60 machines.

('Share & Care' expresses its gratitude to Best Theratronics Limited for granting permission to reprint the excerpt of the article.)

Mind Sharing ...

Prof. (Dr.) K.A. Dinshaw former Director, Tata Memorial Centre, Mumbai, has passionately pursued, all her career, higher quality of cancer care in India. Recently Mr. Ketan Desai, Vice President (Sales), KTPL, had a pleasant meeting and interaction with Madam Dr. Dinshaw to know her perspectives on the positive difference that newer technologies are making to cancer care extending new hope to patients and their relatives.

Q. When you started your career as radiation oncologist, those were the inchoate days of radiotherapy in India with manual after-loader and mainly telecobalt external beam therapy systems. Do you see radiation oncology landscape has vastly changed with the advent of IMRT, IGRT and Tomotherapy?

A. During the last 35 years I have seen a vast change in the scenario of Radiation Oncology in our country. On my return to India after training in the U.K. in 1974, Radiation Oncology was in a very nascent phase. The facilities were very far and few and not upto international standards in many cases. At Tata Memorial Hospital, we still had Deep X-Ray therapy, Cobalt machines and pre-loaded Brachytherapy systems. There were no facilities for simulation or computerized treatment planning systems. Treatment was very empirical. Despite all this nearly 65% of all cancer patients would be eligible for some radiation therapy.

Sep 2007: Seen in the picture is Dr. K.A. Dinshaw (in white saree), the then director of Tata Memorial Centre, alongwith the team of radiotherapy department and representatives of TomoTherapy Inc. and KTPL at the inaugaration of the first TomoTherapy Hi-Art treatment system in India at ACTREC, Mumbai.

Gradually over the last 3 decades this scenario has completely changed. Many centers in our country today can be clearly designated as centers of excellence equal to the best anywhere in the world.

Q. We have moved from the era of 'Trial to Evidence Based medicine' to 'Best Practices'; if it has resulted in standardizing of radiotherapy practice and its clinical outcome?

A. Certainly, the approach to therapy for cancer patients has changed considerably. Radiation Oncology is an integral part of a multi-disciplinary team practicing evidence based medicine. More recently, under the leadership of established cancer centers and departments in the country, quality of life issues with organ preservation techniques have been clearly established as standards of best practice using modern applications of External Beam Radio Therapy and Brachytherapy techniques. This has clearly shown excellent results in Head & Neck cancer, Breast, Bone-soft tissue tumours and Pediatric cancers.

Taking advantage of the large clinical material many Radiation Oncologists, as Clinical oncologists now participate actively in clinical trials. It has also resulted in many more publications both in the national and international journals which have made an impact.

Q. Radiotherapy used to be considered most cost-effective treatment modality for cancer. Has the introduction of latest technologies with its impact, made any difference on the radiation treatment cost? How much these cutting-edge technologies really benefited patients or you feel ultimate in radiation oncology is yet to happen?

A. Radiation therapy in general is certainly a very cost effective modality apart from the initial high investment that is needed to install sophisticated equipments. However the infrastructure installed would treat large numbers of patients for the next 10 -15 years. The returns are certainly much more cost effective than other modalities, such as chemotherapeutic drugs.

In India under the National Cancer Control program there has been a dramatic change with increasing support for upgrading all the National Cancer Centers in the country. However, the Corporate Hospitals in the private sector have primarily brought in the latest technology for the benefits of our patients.

We have been fortunate to have the support of BARC /BRIT / AERB in establishing training facilities and Human Resource Development with safety codes and regulations. Today we have a good reservoir of trained Radiation Oncologists, Medical Physicists and Radiation Technologists all over the country with good basic training and expertise. However, due to the large number of patients that need Radiation therapy there still remains a wide gap between needs and what is available in HRD. There is no question that the cutting-edge technology now increasingly available in both the public and private sector is being used for good practices that will definitely make an appreciable impact in the total management of cancer in our patients.

Q. Day by day the role of medical physics is gaining importance in these precise radiation delivery techniques; and this is combined with the fact that there is acute shortage of trained medical physicists in our country. Does this lead to some sort of sub-optimal use of technology for best clinical outcome?

A. We in India have been very fortunate to have a cadre of well trained physicists with good basic training from BARC and other universities in the country. While this is so, unfortunately the number of physicists available for Hospitals remains low to support the rapid strides in the country. Both our professional associations such as AROI and AMPI being aware of this problem continue to actively support CME programs for training. We have also come full circle to a joint approach using diagnostic imaging and nuclear metabolic imaging playing an integral role in the planning of cancer treatments and follow up.

Q. Now Industry has become very proactive in bringing new technologies. What is your take on this?

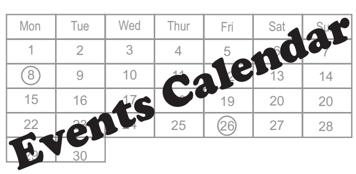
A. Certainly the industry has played a very proactive role in bringing new technologies in the country. This is certainly to be appreciated. However, with the cancer scenario in our country where nearly 75% of patients unfortunately still present with advanced T^3 / T^4 disease there is a role for all modalities of treatment from Cobalt therapy to the most sophisticated IMRT / IGRT techniques. Judicious use of different approaches of EBRT and Brachytherapy can certainly result in better controls for cancer patients. Unfortunately, there is a trend to blindly use high technology with only large numbers of patients being the bottom line of reference, use of aggressive marketing tools and tall claims in the public domain. This is something I am concerned about and would like to caution against.

Q. Through 'Share & Care' would you like to send some message to reach out Radiation Oncology community at large?

A. The overall scenario has changed considerably in terms of human resource development, infrastructure and multi disciplinary approach for the management of cancer. For radiation oncologists the isocenter should be focused as primary clinicians ready to go out to bat for our patients. Judicious management of a multidisciplinary approach by a well trained team in the best interest of the individual patient must be the end point to be always kept in mind.

About Our Guest

Dr. Ketayun A Dinshaw, Former Director, Tata Memorial Centre, Mumbai, India, has an illustrious career spanning decades. She is a member of Advisory Board, Tata Medical Centre, Kolkata, Former Professor & Head, Department of Radiation Oncology, TMH - (1981 - 2002); Padma Shri National Award from the Government of India - January 26, 2001; Past President, International Society for Radiation Oncology (ISRO), (1997-2001), Past President, Association of Radiation Oncologists of India, (1995-1996); selected for UICC roll of honour (1996); elected council member, International Union Against Cancer (UICC) - (1998-2006); WHO Advisor and IAEA Consultant for Radiotherapy in Developing Countries, Member, Atomic Energy Regulatory Board (2005); Member, International Agency for Research on Cancer (IARC) Ethics review committee (2005); to name a few. She was invited to deliver Second International Agency for Research on Cancer (IARC) Lecture with medal of honour, IARC, Lyon, France - May 2006. She is a recepient of Indian Nuclear Society Homi Bhabha Lifetime Achievement Award for the year - 2006. She is a member of editorial board of many International and National Journals with more than 250 scientific articles/features. She participated in over 200 International and National Conferences.



Date	Event	Venue
April 29 - May 1, 2010	American Brachytherapy Society Annual Meeting	Atlanta, USA
May 08, 2010	Stereotactic Whole Body Radiosurgery Symposium 2010, Workshop by Apollo Specialty Hospital	Chennai, India
May 12 - 15, 2010	German Radiology Society	Berlin, Germany
May 14 - 16, 2010	ASTRO Current State-of-the-Art Techniques for IMRT, IGRT and SBRT Symposium	Dallas, USA
June 2 - 5, 2010	International Society for Therapeutic Ultrasound	Tokyo, Japan
June 9 - 12, 2010	World Congress on Interventional Oncology	Philadelphia, USA
June 13 - 17, 2010	American Association of Medical Dosimetrists	Minneapolis, USA
June 13 - 17, 2010	American Society for Stereotactic and Functional Neurosurgery Biennial Meeting	New York, USA

ABSTRACTS

On the impact of longitudinal breathing motion randomness for TomoTherapy delivery.

Kissick MW, Flynn RT, Westerly DC, Hoban PW, Mo X, Soisson ET, McCall KC, Mackie TR, Jeraj R.

Department of Medical Physics, University of Wisconsin-Madison, 1300 University Avenue, Madison, WI 53706, USA.

The purpose of this study is to explain the unplanned longitudinal dose modulations that appear in helical tomotherapy (HT) dose distributions in the presence of irregular patient breathing. This explanation is developed by the use of longitudinal (1D) simulations of mock and surrogate data and tested with a fully 4D HT delivered plan. The 1D simulations use a typical mock breathing function which allows more flexibility to adjust various parameters. These simplified simulations are then made more realistic by using 100 surrogate waveforms all similarly scaled to produce longitudinal breathing displacements. The results include the observation that, with many waveforms used simultaneously; a voxel-by-voxel probability of a dose error from breathing is found to be proportional to the realistically random breathing amplitude relative to the beam width if the PTV is larger than the beam width and the breathing displacement amplitude. The 4D experimental test confirms that regular breathing will not result in these modulations because of the insensitivity to leaf motion for low-frequency dynamics such as breathing. These modulations mostly result from a varying average of the breathing displacements along the beam edge gradients. Regular breathing has no displacement variation over many breathing cycles. Some low-frequency interference is also possible in real situations. In the absence of more sophisticated motion management, methods that reduce the breathing amplitude or make the breathing very regular are indicated. However, for typical breathing patterns and magnitudes, motion management techniques may not be required with HT because typical breathing occurs mostly between fundamental HT treatment's temporal and spatial scales. A movement beyond only discussing margins is encouraged for intensity modulated radiotherapy such that patient and machine motion interference will be minimized and beneficial averaging maximized. These results are found for homogeneous and longitudinal on-axis delivery for unplanned longitudinal dose modulations.

Physics Medicine Biology. 2008 Sep 21;53(18):4855-73. Epub 2008 Aug 18.

PMID: 18711250 [PubMed - indexed for MEDLINE]

News of Interest

Switching on light at night can lead to cancer: Study

London: Switching on a light in the mid of night may trigger such changes in cells that could lead to cancer, a new study has claimed.

Researchers in Britain and Israel found that turning on light for a small duration in the dark of the night triggers an 'over-expression' of cells linked to the formation of cancer. The study is the first to show that even short-term exposure to bright artificial light in dark can be linked to an increased risk of cancer, the Daily Mail reported.

One of the experts, Ben-Shlomo said, "We believe that any turning on of artificial light in the night has an impact on the body clock. It's a very sensitive mechanism.

"If you want to get up to go to the toilet, you should avoid reaching for the light switch. There are some plug-in lights that just glow, that are safe and you could use them as an alternative," she advised.

For research on the "switch-on phenomenon", the team of scientists studied the effect of short-term exposure to artificial light in dark on mice.

During the trial, a group of mice were exposed to a light for one hour. When compared with mice who were kept in the dark, the team observed changes in brain cells responsible for the circadian clock that controls body function.

Earlier researches have shown that those people who worked in night shifts and were exposed to bright artificial light for long term had an increased risk of breast cancer and prostate cancer.

The Times of India, April 13, 2010.

Protein that stops breast cancer spread found

London: In what could be claimed a major breakthrough against breast cancer, scientists have discovered a protein which could stop tumours from growing and spreading.

A team, led by the Netherlands Cancer Institute in Amsterdam, has identified the protein, BRD7, a discovery which may pave the way for potential new treatments to combat breast cancer that affects millions of women worldwide.

According to the scientists, the protein activates an anti-cancer gene, P53, which is already known to combat breast and other tumours.

Without the protein, the gene cannot function to stop tumours spreading. The tumour suppressor P53 gene, which is present in all people, is implicated in up to half of all tumours.

In their research, the scientists, led by Professor Reuven Agami, found that the protein BRD7 activates P53 and could suppress the development of breast cancer, the Daily Express reported.

According to Agami, although it is not clear how BRD7 can prevent the formation of a tumour, it is known that it is not always present in breast cancer. He found that BRD7 activates P53, but when it is not present healthy cells can develop into a tumour.

"I think we have got more understanding of how breast tumours develop," Prof Agami said. The findings, published in the Nature Cell Biology journal, have been welcomed by cancer experts.

Caitlin Palframan of Breakthrough Breast Cancer said: "This research is very interesting because it identifies for the first time that this protein could have a role to play in a significant proportion of breast and other cancers.

"(However) further studies are now needed to confirm this protein's role in cancer before it could be considered a potential target for new treatments."

The Times of India, March 16, 2010.

Over 4.5 million treatments are delivered annually through 250 RT Units installed by KTPL, benefiting thousands of patients everyday.

KTPL Updates

KTPL concludes installation of two more Equinox Cobalt Teletherapy Units

(1)

Installation and pre-commissioning test being conducted at:

1. GGSMC, Faridkot
Mr. Tariq Ahmed (left), Territory Manager, KTPL is seen with Mr. Rahul Shukla, Physicist cum RSO and other radiotherapy department members.

2. IGMC (RCC), Shimla
Seen in the picture is Mr. Sandeep Yadav, service engineer, KTPL.

(2)

Best Theratronics Limited, world-wide leader in their global fight against cancer, redefines gammatherapy

A high level of delegation from KTPL made a business trip to Canadian facility of Best Theratronics and discussed strengthening of their relationships. They also visited Best Theratronics' manufacturing facility and were very impressed to see the state-of-the-art assembly lines in their Ottawa factory which is gearing up to produce gammatherapy systems equipped for conformal image guided treatments.

Seen in the picture is Mr. Amardeep Sethi, CEO, KTPL, meeting Mr. Krishnan Suthanthiran, President, Best Medical Inc.

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Technology from the frontiers of medical science

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