AROI W. B. CHAPTER
CONFERENCE 2011

PROGRAMME
Saturday 5.11.2011

5 P.M. : Welcome address
Inauguration of AROI Con (WB) 2011
Chief Guest’s lecture

5:30 P.M. to 6:30 P.M.

Session 1 : HEAD & NECK ONCOLOGY: PRESENT CONSENSUS

Chairpersons : Prof (Dr)S. K. Sarkar

Prof (Dr) S. Basu
1. Target and ORV contouring: Do’s and Don’ts – Dr. Suman Mallik
2. Excellence in Radiotherapy for H & N Cancers – Dr. Sanjoy Chatterjee
3. Re-irradiation for recurrent H & N Cancers – Dr. Alok Ghosh Dastidar
   – Dr. Suparna Ghosh

6:30 P.M. to 8:15 P.M.

Session 2 : GYNAE AND UROLOGICAL CANCERS, BRAIN TUMOR & RADIATION PHYSICS

Chairpersons: Prof (Dr) Abhijit Basu

Prof (Dr) S. N Mullick
1. IMRT in Gynaecological malignancies: A promise kept ? – Dr. Rimpa Basu
2. Excellence in HDR Brachytherapy for Cervix cancer – Dr. Subrata Saha
3. Evaluation of image guidance in RT and discussion on recent advancement
   – Mr. Biplab Sarkar
4. SRT And SRS application in management of Brain Tumor – Dr Arundhuti Chakrobarty

8:30 P.M. onwards : Cultural Program
Fellowship party

10-30 P.M. : Dinner

(Contd.)
PROGRAMME (Contd.)

Sunday, 6th November 2011

9 AM to 10 AM : Young Oncologist’s forum (Short paper competitive session)

Judges: 1. Prof. Amitabha Ray 2. Prof. Kalyan Bhattacharyay
3. Prof. S. N. Mullick 4. Prof. Abhijit Basu
5. Prof. Amiya Guha

10-11 AM : Interactive Session on Breast cancer

Moderator: Dr. Chandan Das Gupta
Panelists: 1. Dr. Abhisek Basu 2. Dr. Srikrishna Mondol
3. Dr. Kaushik Chatterjee 4. Dr. Sarnendu Basu
5. Dr. Subhankar Deb (Guest) 6. Dr. Bikramjit Chakroborty

11am to 12 noon : Interactive Session on Hepatobiliary Cancers

Moderator: Dr. Subrata Saha
Panelists: 1. Dr. Subhankar Deb 2. Dr. Srikant Sankar
3. Dr. Jyotirup Goswami 4. Dr. Shila Mitra
5. Dr. Suman Mallick 6. Dr. Soumita Poddar

12noon -12-30PM : Session on Radiobiology

Biological basis of concurrent chemoradiation

Speaker: Prof. Kalyan Bhattacharyay

12noon to 1PM: Session: Residents’ forum

Moderator: Dr. Abhisek Basu

PGT & Residents Senior Radiotherapists
1. Dr. Sanjoy Chatterjee
2. Dr. Kalyan Bhattacharyay
3. Dr. Subrata Saha
4. Dr. Alok Ghosh Dastidar
5. Dr. Suman Mallick

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Modality of Radiation therapy crosses a long distance since the introduction of 100-400 kev x-ray unit in 1895, and subsequent discovery of radium. Co-60, Low energy Linear Accelerators, and betatron was introduced between 1950-1965, the treatment setup was limited to the surface marking of the patient. The image guidance was first introduced in terms of portal film by early eighties (1980). The goal of IGRT is a component of the radiation therapy process that incorporate imaging coordinates from the treatment plan to be delivered in order to ensure the patient is properly aligned in the treatment room, or on other words, the rationale of image guidance is to correct setup error. Further developments in the filed in the chronological order are following. In decades of 1990, the IGRT Emergence camera based MV portal imagers, In-room ultrasound localization, marker-based localization and fluoroscopic tracking. In the next decade (2000) image guidance equipped with Flat panel imaging (EPID), KV digital imaging, CT – on rail, KV-CBCT, MV-CBCT. In near future MR along with the Co-60 machine as a form of tomotherapy will be available commercially.

Accurate positioning of the target volume in relation to shaped radiation fields is essential to maximize the efficacy of radiotherapy Treatment. Uncertainties may occur in (i) Outlining target volumes (ii) Variations in patient positioning (iii) Mechanical uncertainties of the equipment (iv) Dosimetric uncertainties (v) Transfer set-up errors from CT and simulator to the treatment unit (vi) Internal organ motion (vii) Human factors. Image guidance allows to correct for Set up errors Inter-fraction organ motion (Inaccurate set up because of organ changes in each fraction), Intra-fraction motion (Organ motion during treatment),
sometime machines mechanical uncertainties, and human error also. Image guidance indicated for Moving target volume, positioning, tumor shrinkage or expansion, changes in shape of the tumor and surrounding anatomy. The 2d image guidance consists of matching planar kilovoltage (kV) radiographs fluoroscopy, CBCT with two orthogonal images. Megavoltage (MV) images with digital reconstructed radiographs (DRRs) from the planning CT. Nevertheless, the 3d image guidance consists of localization of a cone-beam computed tomography (CBCT), data set with the planning, computed tomography (CT) data set from planning. Image guidance can be classified into two categories, one adoptive radiotherapy where setup error and inter fractional organ motion are addressed, and getting where the intra fractional setup error is handled A full implementation of image guided will lead to the concept of adaptive radiotherapy (ART). In ART, the dose delivery for subsequent treatment fraction of the course of radiotherapy can be modified to compensate for inaccuracies dose delivery that cannot be corrected simply by adjusting the patient positioning like in the IGRT. However, ART may have the inaccuracy of Tumor shrinkage during the course of treatment, Patient loss weight during the course of treatment, Increase hypoxia during the course of treatment.

The respiratory getting, either called as Varian RPM or Elekta ABC (Active breath control) needs 4D CT, virtual Simulation software, Motion tracking device, compatible tpS and a Linac with a getting option. Getting significantly reduce the normal lung dose.

Their is few trials which prove that image guidance significantly reduce the dose to the tumor such as lung dose or anterior rectal wall doses in case of pelvis case and again lung doses for the partial or whole breast irradiation, no trial yet suggest that image guidance in creases the survival or local control.

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Throughout the world there is an increased demand for health services. Cancer care, is more expensive regarding its diagnosis and treatment, including radiation therapy, and systemic therapies. Radiation therapy is a cost-effective method of treating cancer, yet it is unavailable in many low income countries throughout the world. In high income countries, the ratio of treatment machines to population may be as high as 6 per million individuals, but in many low and middle income countries, the ratio may be as low as one per 10-70 million individuals.

There is an ongoing debate regarding the utility of cobalt-60 teletherapy in routine practice. Cobalt-60 units have traditionally been “friendlier” treatment machines to place in new low-resource departments with regards to cost, the training required, treatment delivery, planning, and maintenance. However, the production cost of cobalt-60 sources is increasing and there are heightened security concerns. Modern sophisticated cobalt machines are more costly, reflecting increasing pricing. At the same time, there has been a relative decrease in the cost of small, single-energy linear accelerators (linacs), making the two modalities roughly comparable when combining initial and ongoing costs. Cobalt-60 sources must be replaced every 7-8 years (9 with reduced output) at least, requiring disposal of the old sources (an increasingly costly and logistically difficult problem) and this expense must be weighed against cost, commissioning, training, and maintenance of a linac which has a useful lifespan of 10-12 years. QA programmes are more complex for linac units. In some low resource countries, the frequent lack of stable electrical power can interfere with the smooth operation of linacs. Service personnel may have to travel long distances, and parts may not be readily available. Frustrations were expressed with expensive and delicate equipment that was rendered unusable by simple problems, especially when requirements for infrastructure, staff training and maintenance were not initially recognized. The current and emerging need for teletherapy units in developing countries cannot be met by cobalt machines alone. Selecting the right equipment should be mainly based on local radiotherapy experience and presentation of patients, as well as on financial, technical and human resources available.

Oncology cases tops among the causes of death, and in the year 2020 about 20 million new cancer cases may be expected globally from the WHO estimates. Majority of them will be in developing countries with more population, less financial resources, and other major priorities than health problems. More than 70% of all cancer deaths now occur in these countries and cancer kills more people every year than AIDS, malaria, and tuberculosis combined. World Cancer Report by the World Health Organization (WHO)[2] brought out the
type of prevailing cancers in twelve world regions. It is seen that in most of the developing world with higher population, such as south central Asia, sub-Saharan Africa, cancers of cervix uteri, breast, oral cavity, forms the bulk of malignancies. So the most important thing at the current moment for West Bengal or so to say; India is to have treatment facilities for all patients.

Radiotherapy (RT) is one of the major modalities of cancer treatment and about 60% of these patients require RT as curative or palliative intent. International guidelines[1] recommend one megavoltage therapy equipment for every 1,20,000 population, for every 250 new patients providing about 6,250 treatments per year. In the above document, they have calculated based on the assumption that 50% of the patients could be treated for cure (30 to 40 increments) and 50% of the remaining, for palliation (10 to 20 increments). Therefore, 125 patients × 35 treatments (4375) and 125 patients × 15 treatments (1875), respectively, totaling to 6250 treatments. Taking all types of patients treated and various types of treatments, the above number appears legitimate for planning treatment facilities in an RT center. The equipment replacements must be justified based on departmental needs and not based on geographical or political need.[1]

At the outset, the scenario of radiation oncology infrastructure in most of the developing world remains discouraging, with only a handful of centers having modern facilities. Many centers still lack capabilities of simple localization iso-centric simulator x-ray machines, treatment planning systems, 3D imaging capabilities, and mould room facilities. The following argument clarifies above statement. For example, in India for a population of about 1,100 million, at the cancer incidence rate of 70 per 100,000 population, 60% of them requiring RT, we need about 1155 machines assuming a load of 400 per treatment machine annually (currently at West Bengal each centre on an average has about 2000 new patients annually). Presently, there are only 400 tele-therapy machines, about 25% of them have already served for more than 10 years needing urgent replacements. Availability of less number of machines will likely to compromise correct patient care which will have implications in the optimal outcome. Therefore, the scenario needs improvement definitely. However, it is heartening to note that recently in India, the rate of growth is about 25 machines per annum, which is a very good indicator of fast growth of radiotherapy infrastructure.

Recent trends show that high technology centers cluster around corporate sector, generally near the cities, unaffordable to common public, thereby increasing the gap between demand and supply. These centers alone cannot solve the total burden of cancer patients. It is also observed that, wherever replacements of existing tele-cobalt machines were taking place, they are being done with state-of-the-art linacs, which affect the total throughput number of treated patients in these institutions, leaving many patients not receiving treatments. Bulk of the patients are in low socio-economic group and therefore government hospitals and medical colleges only still have to offer services to these patients. In the existing scenario, there is a strong need to make policies to add more treatment machines in public funded institutions and improve the basic needs in these institutions, so that cancer care services are available to all sections of the society.

As early as 1980’s, it was realized that a basic port film is definitely required to confirm reproducibility of treatment fields, and also execution of treatments with good immobilization
techniques. Seldom have these techniques been implemented in most of the existing centers (with skin marks, no immobilization and single field treatment daily used as the standard of care!) which make it difficult for critical analysis of beam quality differences in the treatment outcomes. Without firm base and infrastructure, the clinical application of radiotherapy beams cannot produce optimal results.[3] A more optimistic statement may be that about 50% of existing scenario needs intervention and correction. Which certainly needs a proper radiotherapy planning and execution, especially in these high volume low resource centres, which would actually mean and increased workload of about 50% from the effort that we are actually putting in day to day.

3D visualization methods and computed tomography (CT) imaging have become basic need for treatment planning both for localization and staging of disease. Basic localization, selection of beam center and field placement is possible with simple projected simulator radiograph, which also accounts for beam divergence simulating beam's eye view. If 3D delineated contour is not available, use of multi-leaf collimator becomes redundant. In addition, if immobilization is not proper, a 3D treatment execution and beam direction becomes erroneous and cannot produce better treatment outcome in radiotherapy. In this context, for documentation of correct treatment plans, the role of a therapy simulator is a must. The ratio of sophisticated (IMRT/IGRT etc) to simple treatments will be about 30:70 in the total number of patients and therefore it may be worthwhile to suggest one tele-cobalt machine for simple treatments and one low energy linac for conformal, 3D, intensity-modulated radiation therapy (IMRT) treatments.

For large countries like India based on the incident spectrum of malignancies prevailing, World Health Organization (WHO)[4] recommended tele-cobalt machines as a simple effective equipment. As per the WHO, the main advantages of tele-cobalt machines should be given favorable consideration by the health administrators and governmental agencies. Another WHO report[5] on National Cancer Control Programme, states that “relatively inexpensive cobalt machines are quite easy to maintain and can provide adequate therapy or palliation for most patients, thus making it unnecessary to invest in expensive linear accelerators and other high-energy machines requiring sophisticated maintenance and frequent calibration. For the majority of treatable cancers in developing countries, linear accelerators offer no advantage over cobalt therapy.” The physics factors of 60Co machines[6,7] versus high energy linacs need a revisit by the clinical oncologists. 60Co machine is equivalent to a low energy linac of about 4 MV mean voltage, and provides an acceptable megavoltage photon beam for clinical applications. If the 5 mm build-up thickness is preserved by proper understanding of physics, there will be no problem of skin morbidities. Modern cobalt machines have penumbra trimmers, to cut down excess penumbra thereby reducing dose to critical structures adjacent to tumor volume. Radiation biology has not shown with statistical significance, differences in clinical outcome due to beam quality differences in general and there are no reports available in literature regarding lack of cure rates with simple treatments from 60Co machines. In addition, no one can deny the facts like simple infrastructure requirements (power supply, less power consumption, beam stability, and ease of operations) sufficient for tele-cobalt machines offering cost effective and un-
interrupted treatments to large number of patients even in a rural set up where power fluctuations are commonly encountered.

Therefore, with judicious treatment planning and intelligent executions of treatments, proper results could be achieved with tele-cobalt machines if basic facilities such as simulator and mould room are available. Reddy[8] made an analysis and indicated that low energy linacs (6 MV) are preferred to tele-cobalt machines, the main argument was related to cost of replacement of 60Co sources and management of decayed sources. Experience in the past has shown that replacements of magnetrons/klystrons also should be considered in linacs, along with increased maintenance costs. Management of decayed sources is possible by planning cascade loadings to a similar machine, so that higher dose rates with one machine could be possible, at the same time the life of the source could be prolonged. Attempts to obtain flattened isodose curves from telecobalt machines,[9] adopting multi-leaf collimators,[10] execution of tomotherapy with telecobalt machines[11] have added improvement of beam applications regarding the science of 60Co tele-therapy.

India has the technology for state-of-the-art tele-cobalt machines,[12] and possibility 60Co tele-therapy sources with output as high as 170 RMM (10000 RHM).[13] In addition, a low energy linac could be used for conformal 3D, IMRT treatments and should be available at each center. Further complex treatments with IGRT/IMRT should be referred to higher centres which have ales burden of patients so that a proper planning and execution along with QA can be done. Many low resource countries may benefit from the use of both cobalt units and linacs with use based on complexity of treatment. Therefore, it appears that the time has not come to do away with the tele-cobalt units.

References:


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