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Editorial Office:
Medical Physics Unit,
Dr. B.R.A. IRCH,
AIIMS , New Delhi - 110029
(M) 9810197511,
(R) 26589983, (O) 26594448
Email: drpratikkumar@gmail.com

Editorial

Inculcating leadership qualities in Medical Physics

Medical Physics is a basic science stream with profound application in the medical field. Therefore, it is a professional course which needs to keep pace with the ever-changing medical hospital scenario. Though all streams (subjects) and their application, technology, syllabus, teaching methods and required skills to be learnt change with time but the pace of the change in a hospital set-up has been unprecedented within last a few decades or so. There was a time when being a dedicated Medical Physicist with good knowledge of the subject was considered the corner-stone of the profession. Even today this is the foundation of the good medical physics services to the patients in any hospital. However, the boom of the corporate hospitals along with the professionals managing day-to-day affairs of the hospitals coupled with availability of the electronic medium for information (like internet) has ushered in a paradigm change in interaction of Medical Physicists with the public (patients and relatives who are potential users of the services), peer departments and health administrators. Inter and intra department communications, skill in planning strategies for the professional growth and the education of patients, staff and public was never as important as it has become today. The hospitals now employ trained managers for recruitment, negotiation, marketing of the services to the population, procurement and maintenance of the equipment and even play a role in the promotions of the health professionals. Many times the compensation package may be linked with the perception of the utility or importance of the incumbent's services, especially in the corporate sectors. It is imperative in such scenario that we inculcate the elements of management in our medical physics training which may make us a better team person, a good communicator, a strategic planner to plan ahead for the growth of medical physics services and an efficient manager to manage professional relations with radiation physicians, technologists and public at large. Now-a-days, radiation equipment is being used in a number of departments other than radiation oncology, radiology and nuclear medicine. Some notables are surgical oncology for intra-operative radiotherapy, neuro-surgery with O-arm and mobile CT, interventional C-arm in orthopaedics, urology, gastroenterology, nephrology, anaesthesia, pulmonary medicine, emergency (trauma) medicine etc. Effective communications with all these users as well as with other health professionals and management are essential to put the medical physics profession on the even footing. Therefore, the training of medical physicists may include some elements of communication, strategic planning, management, ethics, organisational relationships and even orientation to the teaching and research. All these may be the part of basic training or they may be imparted in specialized workshops by the school providing medical physics education or our association and its chapters. A good example is EUTEMPE.RX project on the leadership in diagnostic and interventional medical physics. We may emulate some of this project in the education and training of medical physicists in the country.

Pratik Kumar

THE PHYSICS OF CANCER

Prof. Arun Chougule, Ms. R. Gomati. Department of Radiological Physics, S.M.S. Medical College & Hospitals, Jaipur . arunchougule11@gmail.com

Introduction

Cancer is not a new disease and is as old as human civilisation however the incidence of cancer is increasing rapidly. Hippocrates [400BC] reported to have distinguished benign from malignant growths. He introduced the term “karkinos”, from which the word “carcinoma” is derived. Cancer is a complex family of diseases, and carcinogenesis – the turning of a normal cell into a cancer cell – is a complex multi-step process which includes damage to DNA and mutation of cells. According to WHO, Breast cancer is the most common cancer worldwide in women contributing more than 25% of the total number of new cases diagnosed. However, metro cities have more breast cancer cases than Ca Cervix. It is expected that Ca Breast will become the leading cancer among women in India within next few years.

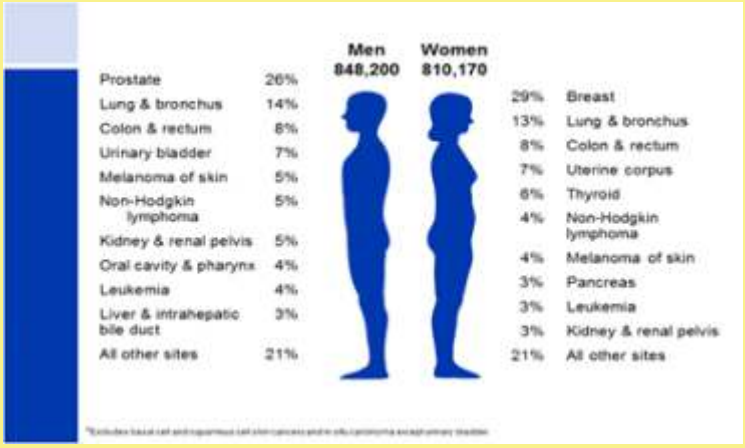

Figure: 1

Cancer early diagnosis is the key to cure it. There is a need of fast, simple, easy to use, inexpensive method. Histopathology considered as gold standard having several limitations: Delay in diagnostic results and Inter observer disagreement

Cancer cells are different to normal cells in various ways

Cancer cells don't stop growing and dividing: Cancer cells don't stop growing and dividing when there are enough of them. So the cells keep doubling, forming a lump (tumour) that grows in size. Cancers of blood cells (leukaemia) don't form tumours but they make many abnormal blood cells build up in the blood.

Cancer cells ignore signals from other cells: Cells send chemical signals to each other all the time. Normal cells obey signals that tell them when they have reached their limit and will cause damage if they grow any further. But something in cancer cells overrides the normal signalling system.

Cancer cells don't stick together: Cancer cells can lose the molecules on their surface that keep normal cells in the right place. So they can become detached from their neighbours.

Cancer cells don't specialise: Cancer cells are not mature, they are not able to work properly. And because they are dividing more quickly than usual, there's a higher chance that they will pick up more mistakes in their genes. This can make them become even more immature, so that they divide and grow even more quickly and haphazardly.

Cancer cells don't repair themselves or die: In Cancer cell, the molecules that decide whether a cell should repair itself are faulty. For example, a protein called p53 normally checks to see if the genes can be repaired or if the cell should die. But many cancers have a faulty version of p53, so they don't repair themselves properly.

Cancer cells look different: Under a microscope cancer cells may look very different from normal cells. The cells are often very different sizes and some may be larger than normal while others are smaller. Cancer cells are often abnormally shaped and the control centre of the cell (the nucleus) may have an abnormal appearance.

Biopsy

For confirmation of malignancy and cancer typing based on tissue, tissue biopsy is the gold standard. A biopsy is the removal of tissue from suspicious area in order to examine it for disease. The tissue samples can be taken from any part of the body. Biopsies are performed in several different ways. Some biopsies involve removing a small amount of tissue with a needle while others involve surgically removing an entire lump, or nodule, that is suspicious. Often, the tissue is removed by placing a needle through the skin (percutaneous) to the area of abnormality. Biopsies can be safely performed with imaging guidance such as ultrasound, x-ray, computed tommography (CT), or magnetic resonance imaging (MRI). These types of imaging are used to determine exactly where to place the needle and perform the biopsy.

Limitations of biopsy: Due to the invasive procedure and many times difficult to reach the tumour site because of critical organs around it turns to be risky. Further the procedure of biopsy diagnosis takes time and is not instantaneous. In some cases, the amount of tissue obtained from a needle biopsy may not be sufficient and the biopsy may have to be repeated. This may be particularly true with trying to make a diagnosis of lymphoma. Rarely, less invasive breast biopsy procedures may be unable to detect some lesions or determine the extent of disease present. If the diagnosis remains uncertain after a technically successful procedure, surgical biopsy will

usually be necessary. Any imaging-guided procedure will not be able to be used unless the area of abnormality can be seen. Some lesions, such as clustered calcifications on mammography are not as clearly shown with ultrasound as they are with mammography. Therefore, stereotactic biopsy is usually used in breast imaging to biopsy calcifications. Fluoroscopy sometimes will not be able to locate chest nodules, and CT will be used for guidance. And all such invasive approaches carry the risk of infection or other complications for the patient

Liquid Biopsy: To overcome these difficulties NCI(National Cancer Institute) developed the tracking cancer -liquid Biopsy.[1]

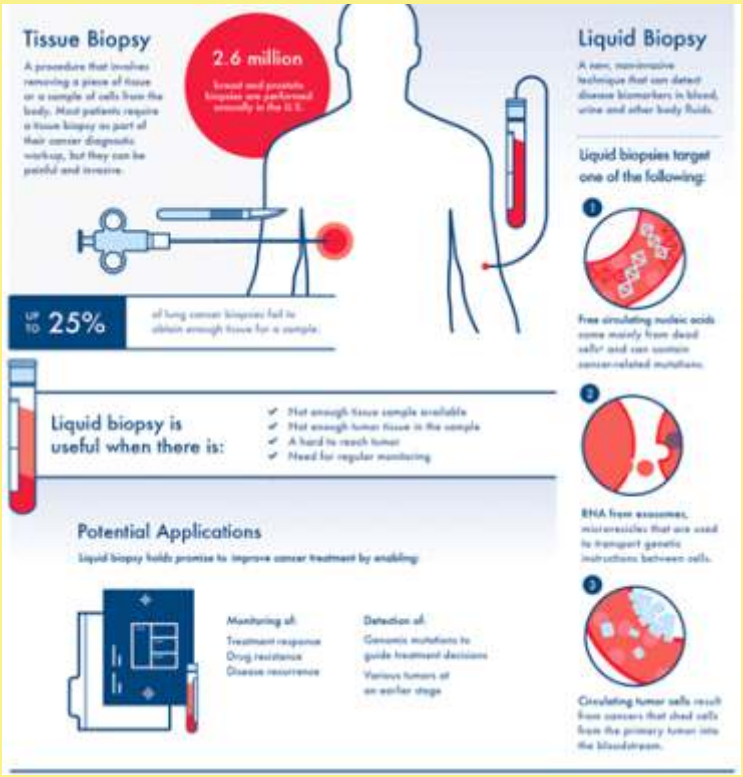

Figure: 2 - Solid and Liquid biopsy procedure

Physical Properties of the tissue

Over the past two decades, however, the field has begun to appreciate that an important part of this cancer growth involves changes in the *mechanical* phenotype .The cell and tissue, as reflected both in intrinsic changes in cell and tissue structure and mechanics and in the biophysical properties of the cell's microenvironment, such as the mechanics, geometry, and topology of the Extracellular Matrix (ECM). The interplay between the biophysical properties of the cell and ECM establishes a dynamic, mechanical reciprocity between the cell and the ECM in which the cell's ability to exert contractile stresses against the extracellular environment balances the elastic resistance of the ECM to that deformation (i.e., ECM rigidity or elasticity) [2]. It has now become clear that this force balance can regulate a surprisingly wide range of cellular properties that are all critical to tumourogenesis, including structure, motility, proliferation, and differentiation might be use to detect cancer.

Characterizing the mechanical Phenotype

Mechanical stress: It is the force applied per unit area to an object (e.g., a cell), and strain is that object's deformation normalized by its initial size. Thus, mechanical stress is expressed in units of force/area (e.g., N/m2 or Pascals (Pa)).Strain is a dimensionless quantity. The mechanical properties associated with the ability of a material to internally store mechanical energy and is therefore independent of the rate of deformation Pascals (Pa). The Young's Modulus offers a way to quantify mechanical differences between tissues, and indeed the measured bulk bulk elasticity of human tissues span some five orders of magnitude.e.g., fat (17 Pa), mammary gland (160 Pa), brain (260–490kPa), liver (640 Pa), kidney (2.5 kPa), skeletal muscle (50 kPa), cartilage (950 kPa). Critical to capture both the elastic, or "storage" properties and the viscous, or "loss" properties. Viscoelastic materials and the aggregate viscous and elastic response of a material to mechanical deformation**.**

Interstitial Forces: Tumour cell involves its ability to withstand nonspecific mechanical forces that arise from the growth of the tumour itself, tissue homeostasis, and transport in the lymphatic system and bloodstream. Even before the initiation of invasion and metastasis, tumour expansion compresses the surrounding ECM, which in turn constricts flow in the vasculature, lymphatic system, and interstitial space. Compression forces can also shrink the interstitial space surrounding the ductal structures, which can in turn concentrate growth factors and cytokines to facilitate autocrine and paracrine signalling and promote tumour growth. Tumour-associated changes in interstitial pressure and compressive stress also present significant challenges for drug delivery to solid tumours. These pressures may be compounded by tumour-induced stromal stiffening, which forces the tumour to exert even higher stresses to expand than would be needed in normal tissue.[3]

Shear Forces: If a tumour cell successfully escapes the confines of its primary tissue of presentation and arrives at the vasculature or lymphatic system en route to metastasis, it must deal with an entirely new set of mechanical forces, in particular those associated with fluid flow and shear .Even if the primary tumour is successfully excised, surgical manipulations such as irrigation and suction may subject tumour cells to substantial shear forces or altered patterns of flow .Exposure to shear can activate specific signalling pathways in tumour cells that can in turn induce dramatic reorganization of the cytoskeleton and adhesive machinery and ultimately facilitate reinforcement of cell structure and attachment to the vascular wall.

The location of metastatic sites

Tumor invades into the bloodstream and develops metastasis at new location: If cells break away from such a tumour, they can travel through the blood stream or the lymph system to other areas of the body and establish new tumours. They continue to grow in new locations. The spread of a tumour to a new site is called metastasis.

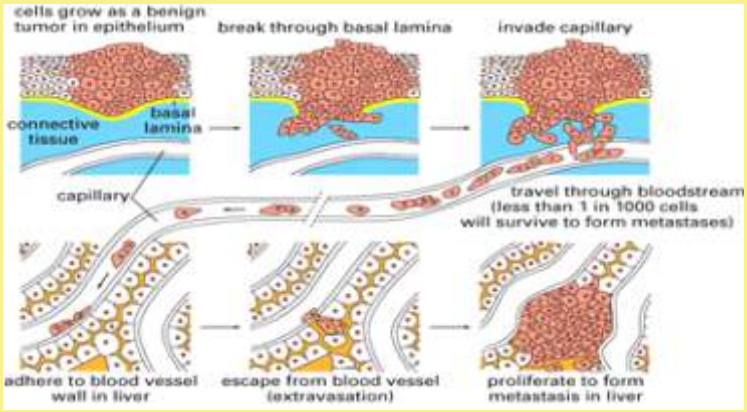

Fig: 3 - Showing the tumour Invasion

The organ capillary bed are characterized by a network of small blood vessels: If a tumour cell encounters a capillary of diameter smaller than the size of the cell $d_{cel}l > d_{vessel}$ then the probability of cell trapping by physical occlusion at that site is very high. For a metastasis to occur, the tumour cell must still extravagate and colonize the local tissue. Every collision between a circulating tumour cell and a blood vessel wall, where $d_{cell} < d_{vessel}$, has the potential to result in adhesion.

Imaging modalities available (diagnosis, staging and treatment of human cancers)

Table: 1- Sensitivity and resolution of cancer cell imaging modalities

MODALITY	TYPICAL VOXEL/PIXEL DIMENSION	MAX NO OF CELLS PER VOXEL/PIXEL	LIMITATIONS
US	1micro L(1x1x1mm)	10^6	Micro bubbles remain intravascular in most tissue
CT	1micro L(1x1x1mm)	10^6	requirement for molar concentrations precludes targeted imaging
MRI	1micro L(1x1x1mm)	10^6	would require $>10^7 gb^{3+}$ atoms per cell for detectability
SPECT	$1.7cm^3$ (12x12x12mm)	$1.7x10^9$	on average approx 0.01 radio atoms per cell
PET	$0.5cm^3$ (8x8x8mm)	$5x10^8$	on average approx 0.01 radio atoms per cell
OPTICAL (2D)	$0.01mm^2$ (0.1x0.1mm)	10^3	surface only NIR fluorescence requires approx 10^4-10^5 fluorophores per cell for detectability
OPTICAL (3D)	$1cm^3$ (1x1x1cm)	10^9	NIR tomography based requires approximately 10^4-10^5 fluorophores per cell for detectability

Vibrational Spectroscopy: One of the big advantages of vibrational spectroscopy, especially IR, is that it is not limited to a particular state of the sample. Spectra can be obtained from liquids, solids (pellets, powders, films, tissues), slurries and suspensions. In principle, Raman has an intrinsic advantage over IR for liquid biological samples, due mostly to the weak scattering of water [4]. To that effect, a significant proportion of IR applications to-date have concentrated on the in-vitro studies of tissues and cells, whereas in Raman spectroscopy the big push is toward the in-vivo diagnostics.

Raman Spectroscopy: Raman spectroscopy is a scattering technique. It is based on Raman Effect, i.e., frequency of a small fraction of scattered radiation is different from frequency of monochromatic incident radiation. It is based on the inelastic scattering of incident radiation through its interaction with vibrating molecules. It probes the molecular vibrations. [5]

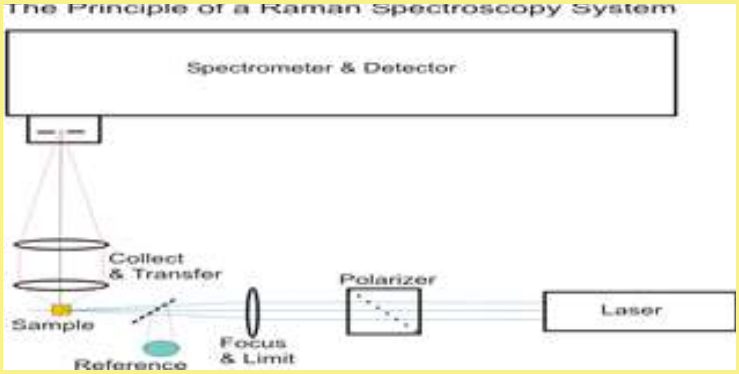

Fig. 4 – Schematic diagram of Raman spectroscopy

Raman spectroscopy can measure both morphological and chemical information in samples and multivariate classification models can be developed to provide objective diagnosis of independent tissue samples obtained from new patients. Raman spectroscopy techniques rely on established optical technologies and offer cost-effective approaches when compared to conventional medical imaging techniques, such as MRI, CT or ultrasound.

PET (Positron Emission Tomography): Positron Emission Tomography (PET) is a nuclear medicine, functional imaging technique that is used to observe metabolic processes in the body. The system detects pairs of gamma rays emitted indirectly by a positron emitting radionuclide tracer fludeoxyglucose (FDG), which is introduced into the body on a biologically active molecule. Use of this tracer to explore the possibility of cancer metastasis (i.e., spreading to other sites) is the most common type of PET scan in standard medical care (90% of current scans). However, although on a minority basis, many other radioactive tracers are used in PET to image the tissue concentration of other types of molecules of interest. One of the disadvantages of PET scanners is their operating cost. PET-CT is the fusion of functional and anatomic information acquired almost simultaneously that lets us see the body and disease in a way that is diagnostically very powerful. By combing the structural anatomic information with functional data, we are able to visualize form and function. An understanding of the normal and benign as well as the pitfalls and artifacts is essential to accurate interpretation.

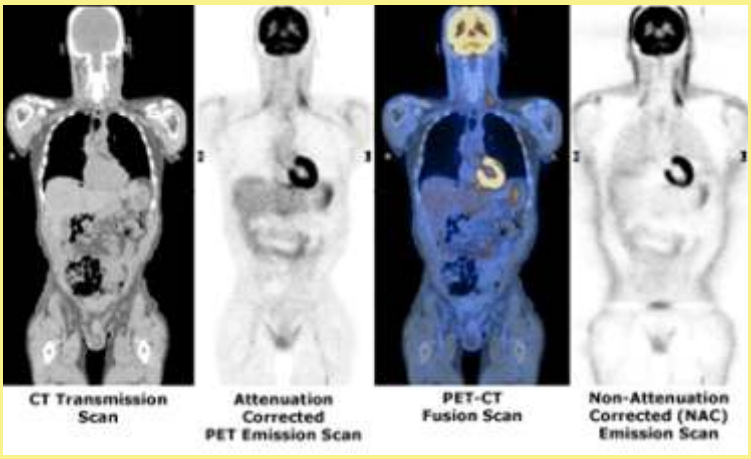

Fig. 5 PET- CT images

The majority of patients still need to undergo an invasive biopsy in order to make and/or to confirm the diagnosis in vitro. Observations regarding the response of glioma cells to substrate stiffness change the increased local stiffness might contribute to increased tension, motility, and proliferation of the tumour cells. Imaging tests can find large groups of cancer cells, but no imaging test can show a single cancer cell. Sometimes Imaging tests can show something that looks like cancer.

Future prospects: Towards molecular mechanisms

Theranostic Nano Particles: The last two decades various nano particles (NPs) have been described and few of them have been suggested for their use in nanodiagnostics and/or nanotherapeutics. Recently, there is a growing interest for Theragnostic NPs, which combine therapy and diagnosis in a single biocompatible and biodegradable nanosystem. However, none of the so far described nanosystems are incorporated in clinical practice, except for iron oxide NPs (IONPs), particularly due to the lack of reproducibility, suitable bio distribution and pharmacokinetics. Several NPs have been successfully combined with imaging modalities, because of their beneficial properties as fluorescent probes (controllable emission wavelengths, sharp emission profiles, robust signal strength and the use of a single excitation source) and their potential for fictionalization with peptides, antibodies and various drugs such as chemotherapeutics. Most studies suggest that NPs systems based on passive targeting of tumour sites, can be more effective for targeting solid, primary tumours with fairly large size (at least 2mm) and well developed vasculatory system. However, early stage primary tumours and micro-metastases do not demand robust blood supply and are not detectable via passive targeting. Therefore, tumour-specific detection via active targeting is still a challenge of great significance. The combination of the existing imaging technology with theragnostic NPs, gives a great advantage for high resolution in vivo cancer imaging, drug monitoring and drug delivery in a specific mode of action.

So far, FDA has approved 35 imaging or/ and therapeutic NPs for clinical trials among them, IONPs, gold nanocages and nanoshells, biodegraded polymeric NPs, silica and silica-gold NPs. However, the incorporation of NPs in molecular imaging still needs a lot of progress since such nanomaterials are characterized by pharmacokinetic properties that cannot be easily controlled.

Genomics: Genomics is the study of the sequence of these letters in your DNA and how each string of letters passes information to help each cell in your body work properly. In cancer cells, small changes in the genetic letters can change what a genomic word or sentence means. Over the past decade, large-scale research projects have begun to survey and catalogue the genomic changes associated with a number of types of cancer. These efforts have revealed unexpected genetic similarities across different types of tumours. **[6]** Genomics is an interdisciplinary field of science focusing on genomes. A genome is a complete set of DNA within a single cell of an organism, and as such genomics is a branch of molecular biology concerned with the structure, function, evolution, and mapping of genomes.

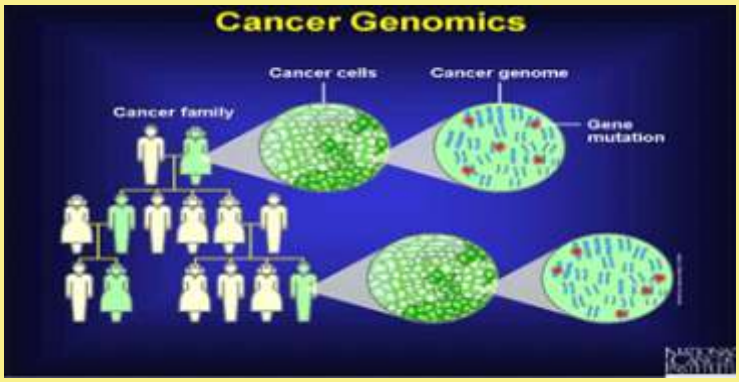

Fig. 6- Cancer Genomics

Radiomics: Radiomics is a field of medical study that aims to extract large amount of quantitative features from medical images using data-characterisation algorithms. These features, termed radiomic features, have the potential to uncover disease characteristics that fail to be appreciated by the naked eye. The hypothesis of radiomics is that the distinctive imaging features between disease forms may be useful for predicting prognosis and therapeutic response for various conditions, thus providing valuable information for personalised therapy. Radiomics emerged from the medical field of oncology and is the most advanced in applications within that field. In the same way that genomics describes the characterization of tumour phenotype using a wide and diverse array of genetic alterations (copy number, gene expression, methylation etc.), the term 'radiomics' refers to the characterization of tumour phenotypes based on a diverse array of image-derived, quantitative measurements (shape, morphology, intensity histogram, texture etc.). The image analysis tools used in radiomics build on those developed over the past

decades for tasks such as computer-aided diagnosis of lung nodules and breast lesion. [7]

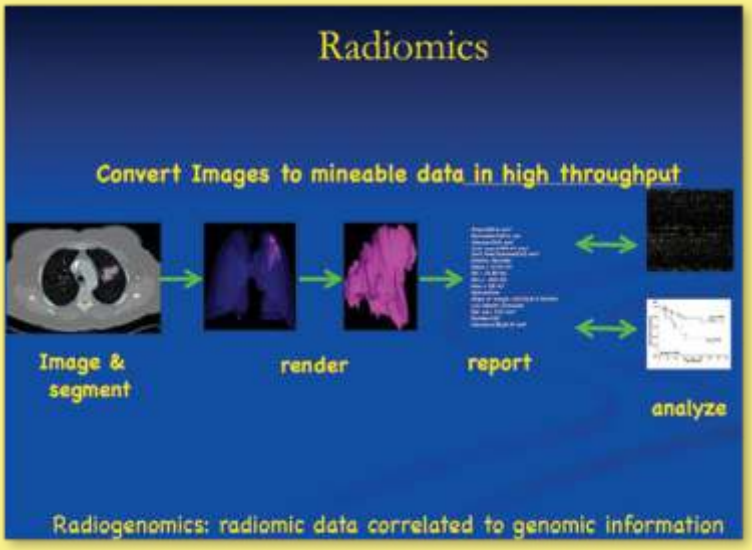

Fig. 7 – Radio-genomics

Solid cancers are spatially and temporally heterogeneous. This limits the use of invasive biopsy based molecular assays but gives huge potential for medical imaging, which has the ability to capture intra-tumoural heterogeneity in a non-invasive way. During the past decades, medical imaging innovations with new hardware, new imaging agents and standardised protocols, allows the field to move towards quantitative imaging. Therefore, also the development of automated and reproducible analysis methodologies to extract more information from image-based features is a requirement. Radiomics – the high-throughput extraction of large amounts of image features from radiographic images – addresses this problem and is one of the approaches that hold great promises but need further validation in multi-centric settings and in the laboratory.

Conclusion

One of the central challenges in understanding the role of the mechanical phenotype in cancer is elucidation of the molecular mechanisms that enable tumour cells to modulate their mechanical responses and phenotype and their ability to sense and actively direct the biophysical properties of the ECM. This problem is particularly daunting because it requires facility with cell biology, biophysics, materials science, and imaging. It also requires a willingness to integrate new knowledge about mechanics and mechanobiology into our existing understanding of the molecular and cellular biology of cancer. The field has made tremendous strides over the past decade towards identifying key molecules and signalling pathways relevant to cellular mechanobiology in cancer.

THREE CHEERS !!!

Dr Rajesh A. Kinhikar, Professor has been appointed as Head, Deptt. of Medical Physics, Tata Memorial Hospital, Mumbai in June 2018. Congrats !!!

References

1 Advanced methods of molecular analysis promise breakthroughs in diagnosis and guided therapy. Christoph Menzel and Michael Kazinski , clpmap 2015.

2 Mechanics, malignancy, and metastasis: The force journey of a tumour cell. Sanjay Kumar & Valerie M. Weaver Cancer Metastasis Rev (2009) 28:113–127.

3 The physics of cancer: the role of physical interactions and mechanical forces in metastasis. Denis Wirtz Nature.com/reviews/cancer July2011, volume11.

4 Vibrational Spectroscopy in the Detection of Cancer. Rina K. Dukor Vysis, Inc., Downers Grove, IL, USA.

5 Selective analysis of antitumor drug interaction with living cancer cells as probed by surface-enhanced Raman spectroscopy. Nabiev IR et al Eur Biophys J (1991) 19: 311.

6 Advancing cancer research through genomics technology evolution. Jian-Bing Fan, TCR Annual volume 4, No:3 June 2015

7 Radiomics in cancer diagnosis, cancer staging, and prediction of response to treatment. Laurence E. Court, Arvind Rao, Sunil Krishnan TCR annual volume 4, No 5, August 2016.

THREE CHEERS !!!

Dr Arun Chougule, Professor & Head, Department of Radiological Physics, SMS Medical College, Jaipur has been elected as Chair of the Education and Training Committee of the International Organisation for Medical Physics (IOMP) and Chairman of the IOMP Accreditation Board (2018- 21) with effect from 5th June, 2018. Very recently in September 2018 he has been appointed Pro Vice Chancellor of Rajasthan University of Health Sciences. Congrats !!!

Dr Sandeep Kaushik, Chief Medical Physicist, Fortis Hospital, Shalimar Bagh, New Delhi has been awarded Ph.D. by Guru Jambheshwar University of Science & Technology, Hisar, Haryana in July 2018. The topic of his thesis was "**Dosimetric study of high energy x-ray in broad beam and narrow beam geometry**".

Dr Kamlesh Passi, Chief Medical Physicist, Mohandai Oswal Hospital, Ludhiana has been awarded with Indian Achievement Award by PARWAH Foundation, Delhi in June 2018 at New Delhi.

AMPI NEWS

Online Membership facility: AMPI has launched online system for enrolment of new members with CC Avenue as payment gateway. An interested person may visit AMPI website www.ampi.org.in and provide the personal and professional details. On submission an email alert would be sent to President / Secretary / Treasurer who will verify the details and the eligibility. After its approval an automatic email will be sent to the applicant with a link for the payment. Once the payment is made the applicant will receive the AMPI Membership Number along with the electronic certificate of membership signed by the President and Secretary.

Constitution Review and Amendment: AMPI has constituted a Constitution Amendment Committee chaired by Shri S.P. Agarwal, Chairman, Board of Trustees. The committee will soon upload the draft of the new constitution at AMPI website and invite comments of the AMPI members for the consideration.

AMPI Workshop and Medical Physics School: AMPI has decided to conduct AMPI workshops of about 1½ day duration in various regions of the country in collaboration with the concerned AMPI Chapters. AMPI will extend substantial financial assistance for conducting the workshop. The interested chapter / organiser may contact AMPI Secretary. The first such workshop was held at HCG, Bangalore in association with Karnataka Chapter of AMPI during 16th and 17th September 2018. The association has also planned an annual AMPI Medical Physics School (2½ days) focused on in-depth teaching programme on a selected topic of common interest. AMPI will also provide substantial financial assistance for this programme. The interested organiser may contact the Secretary, AMPI.

JMP Best Publication Award: AMPI has also proposed to start JMP Best Publication Award for the full text research papers published in Journal of Medical Physics in a year. The award carries Rs. 25,000/- cash prize and a certificate. The process of selecting such paper is in progress.

UPCOMING EVENTS

International Conference on Nuclear and Radiological Emergency Management "ICONRADEM-2019" is being organised by Deptt. of Radiological Physics, SMS Medical College, Jaipur, 9-11 Feb. 2019. For details login www.iconradem.org or contact **Prof. Arun Chougule** at arunchougule11@gmail.com

Annual conference of Northern Chapter of AMPI "NC-AMPICON 2019" is being organised by Deptt. of Radiotherapy, S.N. Medical College, Agra, 2-3 Feb. 2019. For details contact **Prof. Anuj Tyagi** at toaktyagi@gmail.com

WHO's WHERE?

Mr. Pronoy Majhi has joined Deptt. of Radiation Oncology, Mohandai Oswal Hospital, Ludhiana as Medical Physicist in March 2018. Congrats !!!

Dr. Radhakrishnan B Nair has joined Fortis Memorial Research Institute, Gurgaon as Chief Medical Physicist & RSO in June 2018. Congrats !!!

THREE CHEERS !!!

Dr C.P. Bhatt, Consultant Radiation Physicist, Deptt. of Radiation Oncology, Batra Hospital, New Delhi has been awarded Ph.D. by Graphic Era University, Dehradun in September 2018. The topic of his thesis was "**Physical and dosimetric characteristic of volumetric modulated arch therapy (VMAT)**". Congrats !!!

Dr Satish Uniyal has been promoted to Professor (Medical Physics), Department of Radiology, Himalayan Institute of Medical Sciences, Dehradun, Uttarakhand in May 2018. Congrats !!!

Medical Physics Resources

Many of the articles published in AAPM journal MEDICAL PHYSICS are freely available. These may be seen at http://www.medphys.org/

Power Point Slides from AAPM Workshop regarding **Writing Good Scientific Papers and Responding to Critiques** are available at http://www.medphys.org/documents/MedicalPhysicsWorkshopAAPMeeting2015.pdf

AAPM has launched an initiative called MedPhy 3.0 which is an attempt to define and sustain the excellence in Medical Physics in the light of the changing medical scenario which is becoming value based personalised and evidence based medicine. It has attempted to incorporate expertise, innovation and visibility in today's need of precision and perfection. It is planning develop videos underlining the value of medical physics to patients, administration and physicians. The details of MedPhys 3.0 is available at www.aapm.org/MedPhys30/articles/PhysicsModernMedicine.asp

6oth AAPM meeting 2018 was held from July 29 to August 2 at Nashville, TN, USA. A highlight among them was Artificial Intelligence in radiotherapy in general and in faster treatment planning (auto-segmentation, contouring etc.) in particular. Other topics were radiomics in imaging and radiotherapy and Cherenkov radiation imaging. Video interviews regarding these are available at www.itnonline.com/content/blogs/dave-fornell-itn-editor/hottest-topics-medical-physics-aapm-2018

The art of communication is the language of leadership.
James Humes

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TeamBest Theratronics ASIA (P) Ltd.

2/299A, Plot 36, 5th Street, VGP Prabhu Nagar, Perumbakkam, Chennai-600100.India

Tel: +91 75501 92555 Email: asia@teambest.com www.teambestasia.in

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