Abstract - ID: 11

Author(s): Mousa Bakkari **(Presenter)**, Prince Sultan Military Medical City
Khaled Soliman, Canada
Abubkar Ahmed, Al-Gafari Company

Title: Measurement of entrance surface dose during chest x-ray examinations in neonatal intensive care unit using OSL dosimeters

Abstract:

ABSTRACT

Purpose:

Pediatric patient are known to have higher sensitivity to ionization radiation. Monitoring of radiation doses received by neonatal patients in our hospital is of primary importance to our patient radiation safety program in. We are proposing to measure the entrance surface dose (ESD) using OSL dosimeters due to their higher sensitivity in comparison with TLD both used for occupational dose monitoring at our institution.

Methods and Materials:

Entrance surface dose was measured using the IAEA TRS-457 dosimetry protocol. The x-ray machine was a portable one routinely used in the PICU set up at the hospital with the following parameters: kV ranged from [70-73], the mAs [1.6-2.5] and the SID [100-115] cm. We have used a neonatal body phantom (Model: 610 GAMMAX) to simulate the patient body and the dosimeters were place on top of the phantom. Both OSL and TLD readings were cross checked with a diagnostic x-ray shadow free PTW ionization chamber model: SFD 34060 coupled to an electrometer model: UNIDOS E.

Results:

The range of measured ESD during chest x-ray examination of the neonatal patients in our institute was [54-76] μGy respectively. The OSL were found suitable to conduct ESD measurements during chest X-ray exam for the neonatal patient. The obtained patient dose measurement will serve as an indicator of quality and patient safety standard in diagnostic radiology services.

Conclusion:

The measured values are within internationally published data. The study serves as a benchmark to our clinical practice against international diagnostic reference levels (DRL) in pediatric radiology.

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Abstract - ID: 13

Author(s):	Konstantin Fateev **(Presenter)**, Moscow Children Hospital
Title:	Radiation treatment planning for children based on MRI only: first steps.
Abstract:	

K. Fateev[1,2], V. Belyaev[2], M. Smorodina[2]

[1] Dmitry Rogachev National Research Center of Pediatric Hematology, Oncology and Immunology, Moscow, Russia

[2] National Research Nuclear University, Moscow, Russia

[1] *e-mail: k.m.fateev@gmail.com ; [1] phone: +79057571742*

At present CT is used as imaging method in radiation treatment planning. It is impossible use only the MRI-based radiation treatment planning because of the lack of electron density information.

The lack of electron density information in magnetic resonance images (MRI) poses a major challenge for MRI-based radiotherapy treatment planning (RTP). In this study the authors convert MRI intensity values into Hounsfield units in the head region and thus can enable accurate MRI-based RTP for children cancer patients with tumors in head with varying tissue anatomy and body fat contents. The authors of another researches showed – MRI-based RTP can be used for prostate cancer patients. The main task of this study – to adapt this method to treat children cancer patients in Moscow Children Hospital.

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Abstract - ID: 22

Author(s):	ALI ZAILA **(Presenter)**, Prince Sultan Medical Military City Marouf Adili, Marouf M. Adili Abdulla Al-Rushood, Prince Sultan Medical Military City Saleh BaMajbour, Prince Sultan Medical Military City
Are you an invited speaker/presenter to ICRM2018?:	No

Title:	IN-PHANTOM AND WELL-TYPE IONIZATION CHAMBER CALIBRATION TECHNIQUES COMPARISON FOR Ir-192 HDR BRACHYTHERAPY

Abstract:

Introduction: The Well-type ionization chamber (WIC) is the standard method to measure the Air-Kerma strength for the Ir-192 source, the aim of this study is to validate the using PTW Al T9193 phantom.**Method:** For phantom measurement, Farmer chamber PTW 30012-1, 0.6 cc and electrometer PTW UNIDOS E were used. The chamber has a calibration factor in terms of $N_{D,\ W}$. at reference beam quality *Co-60*.The phantom is 20-cm diameter with 4 holes for detector adaptors and one hole at the center for afterloading applicator. The following formula was applied to calculate the air-Kerma: Where M_{PMMA} is the collected charge per time interval (nC/min), correction factor for beam quality, correction factor for energy loss due to bremsstrahlung, is the mass energy absorption coefficients of air to water, K_{wp} correction factor for perturbation of radiation field between water and PMMA, correction factor for the influence of the PTW phantom, correction factor for volume effect of the ionization chamber. correction factor to account for the different distances between measurement (8cm) and reference point (100cm). All factors were calculated using Monte Carlo simulation EGSnrc code (Ubrich F. 2013). The was measured for 5 Ir-192 sources.**Results:** The $K_{A,100,PMMA}/K_{A,100,HDR\text{-}1000}$ is approximately constant with a mean value equal to 0.997±0.005 (-0.28%).**Conclusion:** The results underline the equivalence of in-phantom calibration method to the WIC.

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Abstract - ID: 24

Author(s):	Mohammed Hocine TEDJINI **(Presenter)**, University of Science and Technology of Oran Mohamed BOUDIAF

Title:	First principales calculations of physical proprieties of semiconductor materials for radiation detectors

Abstract:

In this study, Theoretical modeling based on density Functional theory calculations (DFT) is used for determined structural, electronic and elastic proprieties of semiconductor materials using in radiation detectors by Abinit computer code with using the generalized gradient approximation (GGA) and Local density approximation (LDA). In other part, detection efficiency in 400-1400 KeV high energy range by determined the absolute and photo-peak detection efficiencies are simulated by Monte Carlo method implemented in Geant4 package. The obtained results of lattice

parameters, bulk modulus, Band structure, elastic constants showed reasonable agreement with the previous results of other calculations and experimental measurements and comparted with results of detection efficiencies simulations.

Keyword:

Semiconductor, structural and electronic properties, DFT, Monte Carlo, detection Efficiency.

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Abstract - ID: 35

Author(s): Hamid Hamid **(Presenter)**, Taif University

Are you an invited speaker/presenter to ICRM2018?: No

Title: Assessment of Patients Radiation Dose In Common Radiographic examinations in Taif

Abstract:

Background : Protecting the patients during diagnostic procedure is an important responsibility of radiologic staff to keep radiation dose's level as low as reasonable practicable. Due to the lack of records, and less international scientific publications from our community concerning patients radiation doses in the Kingdom. and expansion in health sector in the Taif and throughout the Kingdom, for all these reasons we have done this study. **purpose:** the current study , was aimed to assess patients Entrance skin dose (ESD) in common diagnostic x-ray examinations in Taif city. **Methods and materials:** the study was conducted in three different hospitals in Taif city, these hospitals indicated in this study as I, II and III, 221 images was performed in the aforementioned hospitals, utilized DOSCAL formula technique , collection sheet was designed to record technique factor (kVp, mAs) and patients characteristic bio-data. **Results:** The average ESDs for all examinations was 1.67mGy ,while average kVP was 64.6 kVp, also the highest ESDs was associated with lumber-spine and pelvis 7.4 and 6.3mGy respectively, while kVp and ESDs was correlated (R^2=.976). Hospital I showed lowered ESD in most investigations than other hospitals, hospitals II showed higher ESDs for most pelvis and lumbar spine ,while hospital III showed moderate ESDs values for lumbar spine..**Conclusion:** although study concluded that ESDs obtained in all examinations were lower from previous studies, more studies in this field are required in order to establish local diagnostic reference level. LDRL

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Abstract - ID: 46

Author(s):	Reem Alanazi **(Presenter)**, King Saud University
Are you an invited speaker/presenter to ICRM2018?:	Yes
Title:	Geant4 Study of HDRK-Man Mathematical Phantom During Cardiac SPECT Imaging

Abstract:

The present study aims at applying Monte Carlo simulation technique on the SPECT cardiac imaging for the purpose of diagnosis and early detection of heart disease (i.e. calcification, tumors and heart malfunction). We used toolkit Geant4 to simulate the interaction of particles with a human body model; High-Definition Reference Korean-Man (HDRK-Man) voxel, which its specific data was provided by the Korean team. The voxel model, adjusted to the Reference Korean Man, is 171cm in height and 68 kg in weight and composed of 30 million voxels of size (1.981x1.981x2.0854)mm^3.We developed a Geant4 code using the "G4VNestedParameterisation" class to generation primary particles randomly after uniform distribution of the inserted radio-pharmaceutical Technetium-99m (99mTc) Within the heart organ which emitter photons at a mean energy of 140keV, then, the gamma camera is rotated around the model with specific angles covering the 360^0 area studied.The output data including the interaction positions and deposited energy is then converted into a digital image[512x512]pixels using a C + + code.Images are then converted into Sinogram and then reconstruction was studied using the Filtered Back Projection (FBP) and Maximum Likelihood Expectation Maximization (MLEM) methods by ImageJ software.Both methods were compared and we found that the FBP method is faster but yet resulted in a less clear and accurate image then MLEM method.

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Abstract - ID: 50

Author(s):	Hamid Hamid **(Presenter)**, Taif University Abdulaziz AL-Bogami , Student Mohamed Ahmed, Assistant Professor
Are you an invited speaker/presenter to ICRM2018?:	No

Title:	Evaluation of Entrance Skin Dose for Children during Chest Radiography Procedures

Abstract:

Chest roentgenlogical procedures, known also as chest x-rays, is the most frequent imaging performed in radiology departments in children hospital nowadays. The aim of this study was to evaluate radiation dose for children during chest roentgenlogical procedures and also to estimate organs radiation doses. Hundred children aged between 5-10 years performed a routine chest x-ray, several projections were applied but only the posterior anterior and lateral projections were measured in the study.in radiology department at Makkah Maternity and Children Hospital, KSA.

The children biodata (age, weight, height, gender and body mass index BMI were recorded. The exposure factors, focal skin distance, tube output and back scatter factor were uploaded in DOS CAL software in order to calculate the Entrance Skin Dose ESD. The range of kilovoltages and ESDs obtained were 40- 70 KVp and 0.11-0.55 mGy respectively per projection for different ages and groups and both intended chest projections. Significant correlation coefficients were found between tube potential, children weight and ESDs. The mean radiation dose in lateral chest was 0.32±0.06 mGy . Skin and lung absorbed more radiation dose than other organs. The results of radiation dose for children chest roentgenlogical procedures matched and compatible with literature. The results presented will serve as a baseline data needed for deriving local reference doses children chest roentgenlogical procedures.

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Abstract - ID: 61

Author(s):	MUHAMMAD SHAHBAZ **(Presenter)**, Punjab Institute of Nuclear Medicine (PINUM)
Are you an invited speaker/presenter to ICRM2018?:	No

Title: Risk Stratification of Radiation Exposure to General Public from the Patients of CA Thyroid and Benign Thyroid Diseases

Abstract:

Iodine-131 is known as gold standard for the treatment of thyroid diseases. PINUM is the only institute in Faisalabad which is providing facilities to diagnose and treat thyroid diseases specially radioiodine therapy. Release or hospitalization of patients undergoing radioiodine therapy depend on the medical needs of patient, their pattern of contact with other people, their age, their home environment, their contact with children and pregnant women. Faisalabad is the third largest city of Pakistan. Currently Faisalabad´s economy faces many challenges which include load shedding of gas and electricity. The aim of this study was to find the impact of socioeconomic status of thyroid cancer patients of Faisalabad and surrounding areas (with in mini distance of 50 Km from PINUM) on the general public regarding radiation exposure. In this study observations were performed on 120 patients, 100 benign diseases

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Abstract - ID: 88

Author(s):	Marwa Selmi **(Presenter)**, College of Applied Medical Sciences, Majmaah University Ahmed Mansour Almansour, Department of Radiological Sciences and Medical Imaging, College of Applied Medical Sciences, Majmaah University, Majmaah 11952, Saudi Arabia Yousif Mohamed Y. Abdallah, Department of Radiological Sciences and Medical Imaging, College of Applied Medical Sciences, Majmaah University, Majmaah 11952, Saudi Arabia Hafedh Belmabrouk, Department of Physics, College of Science Al-Zulfi, Majmaah University, Al-Zulfi 11932, Saudi Arabia
Are you an invited speaker/presenter to ICRM2018?:	No

Title: Computer investigation of breast cancer tumor treatment using microwave ablation (MWA)

Abstract:

Thermal ablation has recently become a novel technique to kill cells cancer tumors in the liver, kidney, bone, lung, and other organs. This technique is widely used to treat tumors that are difficult to treat surgically. The ablative treatment family takes accounts the microwave ablation (MWA), the radiofrequency ablation (RFA), and ethanol ablation. These ablation methods used the heat transfer to treat and kill cells cancer. RFA has been developed and used in the clinical treatment in USA while the MWA is still a current research topic and reveals ongoing improvement. Computer simulation proves to be necessary in the phase of the design and optimization of novel devices, and it is a useful tool for exploring and planning treatment strategies. In order to assess the feasibility of using the computational models of MWA to tissue biophysical properties, an electromagnetic model and bio-heat equation are coupled and computed with the finite element method (FEM). A micro-microwave coaxial antenna (MCA) is inserted into the biological tissue can emitted an energy that creates heat in the tissue. The heat will be distributed around the surrounding tissue. In this work, we focused to study numerically the temperature distribution profile, the specific

absorption rate (SAR) and the fraction of the necrotic tissue to treat breast cancer. The results show that the SAR is higher in the case of single slot antenna than those of dual slot antenna. The SAR is reduced by 17% using the dual slot antenna.

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Abstract - ID: 365

Author(s):	FSZ FSZ **(Presenter)**, KFSHRC
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Abstract - ID: 392

Author(s):	Sathiya Raj **(Presenter)**, American Oncology Institute James Samuel, Senior professor
Are you an invited speaker/presenter to ICRM2018?:	No
Title:	Effective Atomic Number of Polymer gel Dosimeter for Electron Interaction

Abstract:

Effective Atomic Number of Polymer gel Dosimeter for Electron Interaction

Gel dosimeter is an excellent water equivalent medium. At the same time, it can detect the radiation. This dual purpose of gel dosimeter (phantom as well as detector) can prompt the researchers to adapt the gel dosimeter in radiotherapy for three-dimensional dose verification. Gel dosimeter is a true three-dimensional dosimeter, as it provides very good spatial dose information. Since, water equivalency property is a major concern in radiation dosimeter, it is necessary to evaluate water equivalency for any medium which has to be used as an alternative for water. Effective atomic number (Zeff) is the agreeable parameter to evaluate the water equivalency for a given medium.

In this study, we update the Zeff data for some new gel dosimeter. The effective atomic number of 21 polymer gels was calculated for electron beam from 10keV to 1GeV. The maximum deviation in Zeff from water was found to be 13.98% at 0.175MeV for ABAGIC gel, and it was 7.6% for PRESAGE at 0.02MeV. All the other polymer gels showed a difference below 2.6%. Since the collision and radiative process of the electron with PRESAGE and ABAGIC were greater than that 67 of other gels at low energy, it caused significant variations in the Zeff. While energy increases, the radiative collision also increases, which in turn leads to increments in the Zeff for all polymer gel dosimeters. From this study, we present the Zeff of new types of polymer gel dosimeters.

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Abstract - ID: 397

Author(s):	Khalid Iqbal **(Presenter)**, shaukat khanum memorial cancer hospital and research center lahore
Are you an invited speaker/presenter to ICRM2018?:	No

Title:	Quality assurance of intensity modulated radiotherapy treatment planning: A comparison study

Abstract:

Aim: The Purpose of this study was to analysis the comparison of intensity-modulated radiation therapy quality assurance (IMRT QA) using GAFCHROMIC® EBT3 film, Electronic Portal Imaging Device (EPID) and MapCHECK®2. **Background:** Pretreatment authentication is main apprehension in advanced radiation therapy treatment plans like IMRT. **Materials and methods:** Twenty patients were planned on Eclipse treatment planning system (TPS) using 6 MV and 15 MV separately. **Results:** Gamma index of EBT3 film results show the average passing rates was 97% for 6MV and 96.6% for 15 MV using criterion of ±5% of 3mm, ±3% of 3mm and ±3% of 2mm for brain. Whereas by using ±5% of 3mm and ±3% of 3mm criterions, the average passing rates were 95.4% on 6MV, and 95.2% on 15 MV for prostate. For EPID, the results show the average passing rates were 97.8% for 6 MV, and 97.2% for 15 MV in brain case. Where ±5% of 3mm and ±3% of 3mm were used, the analysis gives average passing rates as 96.6% for 6 MV, while 96.1% for 15 MV in prostate case. MapCHECK®2 results show average passing rates of 96.4% for 6MV and 96.2% for 15 MV respectively for brain using criterions of ±5% of 3mm, ±3% of 3mm and ±3% of 2mm. Whereas for ±5% of 3mm and ±3% of 3mm, the average rates are 95.2% for 6MV, and for 15 MV 94.7% in prostate. **Conclusions:** The EPID results are better than other and hence EPID can be used effectively for IMRT pre-treatment verifications.

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Abstract - ID: 406

Author(s):	Ahmed Mohamed **(Presenter)**, National Cancer Institute (NCI-UG), University of Gezira.
Are you an invited speaker/presenter to ICRM2018?:	No

Title: Evaluation of Critical Organs Dose for Prostate Cancer: A direct Comparison between 2-D Versus 3-D Treatment Planning Techniques

Abstract:

Introduction. Radiation therapy treats cancer by using high-energy radiation to shrink tumors and kill cancer cells; by damaging their DNA. X-rays, gamma rays and charged particles are types of radiation used for cancer treatment [1]. Accuracy of dose delivery is important to achieve the goal of radiotherapy, localization of the target volume (PTV), the area that will receive the maximum amount of the dose, and delineation organ at risk (OARs), the volumes and organs that must receive the minimum dose.

Purpose. This study was to make Evaluation of Prostate cancer planning using 2-dimensional Conventional and 3-dimensional Conformal Radiotherapy (3DCRT).

Materials and Methods. The design of the study was based on same subject repeated measures. Selected subjects who had completed 2D RT had their treatment re-planned using a 3D technique

(using the PlanW 2000 Treatment Planning System, UJP PRAHA)

Results. The results of this study essentially indicate that the 3D planning technique improves the radiation dosimetry to the tumour volume by increasing the radiation dose received at the 100%, 90% and 50% (D100, D90 and D50) of both GTV and PTV

Conclusion. This study has demonstrated that 3D planning for the radiation therapy of prostate cancer using a 5-field technique and 1.5 cm margins around the GTV results in better radiation dosimetry to the PTV as measured by the D100, D90 and D50 relative to 2D planned radiation therapy using the same field arrangement, but at the expense of higher rectal D100, D90 and D50, as well as the area under the rectal DVH.

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Abstract - ID: 410

Author(s):	Ghulam Murtaza **(Presenter)**, International Islamic University Islamabad
Are you an invited speaker/presenter to ICRM2018?:	No

Title:	Optimisation of Volumetric Modulated Arc Therapy (VMAT) Planning Parameters Using Limited Aperture Multileaf Collimator: A Study of Prostate and Head-and-Neck Cancers

Abstract:

The use of VMAT technique to deliver IMRT from conventional to very specialized treatments like SBRT/SRS using rapidly-growing allied-technologies presents a challenge in plan optimization. This study aims to evaluate VMAT planning techniques for SynergyS®-Linac (Beam-Modulator™) of Elekta providing a maximum aperture of 21 × 16 cm², in contrast to the other reports for conventional Linac (40 × 40 cm²). Three VMAT plans for nine of each prostate and head-and-neck cancer patients were simulated for a 6 MV photon beam of SynergyS® Linac using SmartArc™ module of Pinnacle³ TPS. The VMAT techniques Single-arc, Dual-arc and two combined Independent-single-arcs were optimized for a setting of collimator angle 45°. The dose plans were compared for optimal target coverage and maximum OARs sparing, to test for significance 'student t-test' ($p \leq 0.05$) was used. All VMAT techniques produced clinically acceptable dose-plans for prostate with no significant p-values. For head-and-neck DA and ISAs techniques improved dose volume indices over SA significantly, DA -vs- SA (D95% - 0.00, CI - 0.00, HI - 0.02) and ISAs -vs- SA (D95% - 0.00, CI - 0.01, HI - 0.02). DA and ISAs provided best target converge and sparing of OARs compared to SA for both prostate and head-and-neck planning. In spite of different optimization approach DA and ISAs provided similar target coverage and treatment delivery times, while dual-arc improved sparing of OARs. In complex PTV and OARs geometry, the ISAs can be a substitute to DA, when treating at Elekta Beam-Modulator collimation system (21 × 16 cm²).

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Abstract - ID: 454

Author(s):	Mustafa Mohamed **(Presenter)**, Sudan Academy of science Ibrahim Suliman, Al Imam Mohammad Ibn Saud Islamic University (IMSIU)
Are you an invited speaker/presenter to ICRM2018?:	No

Title: Estimates Effective Dose in Adult CT Examination

Abstract:

The our goal of this study to estimated effective dose (E) in adult CT examination for Toshiba x64 slice using CT. Exp version 2.5 software in Sudan. In order to achieve these objectives, data of CT-scanner has been collected from three hospitals, which consist on survey for scanner parameters and equipment's. Data were used to assess doses for 300 patients underwent common examinations. The DLP, effective dose and organ doses were estimated, related CT exposure parameters, used CT Exp version 2.5 software. A large variation of mean effective dose and organ doses among hospitals was observed for similar CT examinations. These variations largely originated from different CT scanning protocols used in different hospitals and scan length. The mean effective dose in this study the Brian, PNS, Chest, Pulmonary, Abd-Pelvis, Pelvis, KUB and CTU were 3.2 mGy, 2.6 mGy, 18.9mGy, 17.6 mGy, 27.1 mGy, 11.2 mGy, 9.6 and respectively, and organ doses presented in this study for the eye lens, lungs, thymus, liver, small intestine, uterus, gonads, bone marrow and bladder were 62.9 mGy, 39.5 mGy, 34.1 mGy, 35.4 mGy, 53.9

mGy, 43.1 mGy, 34.6 mGy, 8.9 mGy and 67.9 mGy, respectively. These values were mostly comparable to and slightly higher than the values of organ doses reported from the similar study and the ICRP report 103. It was concluded that patient effective dose and organ doses could be substantially minimized through careful selection of scanning parameters based on clinical indications of study, patient size, and body region being examined.

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Abstract - ID: 518

Author(s):	Zohal Emam **(Presenter)**, Industrial Research Consultancy Center (IRCC) Elhussien Sirelkhatim, Radiation Isotops Center Khartoum

Are you an invited speaker/presenter to ICRM2018?:	Yes
Title:	Developing of Adjustable 3D Breast Models for Computational Dosimetry

Abstract:

Monte Carlo technique has been used heavily during last decades in simulating breast imaging and radiotherapy. The main challenge in this issue is to find a breast with desired anatomical features, and the breast size one of the important parameters affect dose distribution measurements. In this work we describe and evaluate a method to obtain 3D breast models for dosimetrical studies with desired sizes. Make human software was used to generate surface chest models with three breasts cup with sizes of: A, C and E according to European standardization system of dress, then Blender software was used to prepare and add 3D models of ribcage, heart and lungs to each of the three chest models. These models were sliced and passed to Gate Monte Carlo to simulate the irradiation of tumor bed at 2.6 cm from chest wall of left breast for each model by electron beam with energies of 6, 9, 12, 15 and 18 MeV. All beams has normal incident with field size of 5*5 cm^2 and SSD of 100 cm. The dose for breast, heart and lungs was evaluated for each model with each energy. The energies 9, 12 and 15 MeV showed adequate distribution for sizes A, C and E respectively While 6 and 18 MeV were found unsuitable in these cases. These results were in good similarity with physics of radiotherapy and proved the usability of the developed method.

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Title:	Quarterly Quality Control Procedures of the SPECT Systems

Abstract:

Quarterly quality control (QQC) tests for gamma cameras with SPECT systems are highly recommended to evaluate the system performance. These tests were performed after each periodical preventive maintenance (PPM) on quarterly bases. It is recommended to test the systems before the clinical use, this evaluation will find out any deficiency in the camera performance that could affect the clinical studies. These procedures follow a well established tests recommended by the IAEA or other agencies.

This study would suggest an updated QQC tests that were performed after the PPM during the last six months for several SPECT systems. These tests include; Intrinsic Energy Resolution, Intrinsic Flood Field Uniformity, Intrinsic Count Rate Performance in Air, Extrinsic Flood Field Uniformity, System Spatial Resolution and Linearity, Whole Body System Spatial Resolution Without Scatter, Planar Sensitivity, and Total Tomographic Performance tests. Description of these tests will be explored showing some images and results.

The results of these tests showed occasionally certain deficiencies in image quality or gamma camera performance. For example; the Photopeak and Window Setting, Extrinsic Flood Field Uniformity, Total Performance tests and others. Following this protocol will enhance the role of the medical physicists in the institution and will encourage the maintenance engineer to maintain a very well calibrated system producing a good quality images.

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