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www.36.icrad.ir
Email: ICR2020@irsr.org
Phone: +9821 44462076
Fax: +9821 44411224

Abstracts book

18th Iranian Congress of Radiographic Sciences

Nov 2020-Jan 2021

WELCOME

Dear colleagues,

As the president and scientific secretary of the conference, I am pleased and honor to welcome you to the 18th congress of Radiographic sciences.
At this congress there has been an attempt to educate and improve relative techniques and various test approaches to imaging in order to develop the knowledge and capabilities of colleagues.
Moreover, having considered the rapid pace of growth and evolutions in the field of medical imaging and the need for acquaintance with modality, technique and new applications,the latest guidelines to recent radiography worldwide will be introduced .
Therefore, the Congress has gathered a team of the best medical imaging physicists and applicator specialists along with the country's top-notch radiography experts to represent talks and judging the presented articles.
The congress mainly deals with Musculoskeletal, vascular and Interventional Radiology, Cardiothoracic, women and obstetric imaging, and Artificial intelligence in Radiology, with particular focus on establishment and innovative performance in Medical imaging for to achieve the best diagnosis.

Mohamad Akbarnejad

President & Scientific Secretary

WELCOME

As the president of Iranian Radiography Sciences Association (IRSA), it is my great pleasure to welcome you to the 18th Radiography sciences congress organized by IRSA.
Our colleagues in the Scientific Committee have prepared a highly scientific course for this congress.
This conference deals with Musculoskeletal, vascular and Interventional Radiology, Cardiothoracic, women and obstetric imaging, and Artificial intelligence in Radiology.
This congress is an opportunity for Radiotechnologists to discover the latest imaging techniques, share the latest scientific research and learn about the modern imaging modalities and equipment.
I believe that everyone can find their favorite scientific topics in this Congress and benefit from this wonderful Festival.
We look forward to seeing you all at the 18th Congress of IRSA.

Morteza Afrah
President of Iranian Radiography Sciences Association (IRSA)

Scientific Committee of IRSA
(Alphabetically Ordered)

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Ali Shabestani Monfared, PhD
Hedayatolah Soroush, MSc
Ali Saeedi,BSc
Ali Tavakkoli,MSc

Lecture webinar titles

18 Nov 2020-28 Aban 1399
Presenter : Vahid Shahmaei
Title: Breast MRI pitfalls and common errors

25 Nov 2020-5 Azar 1399
Presenter : Ali Shabestani Monfared, PhD
Title: PET in Oncology

2 Dec 2020-12 Azar 1399
Presenter : Hedayatolah Soroush
Title: Review of Imaging Strategies in Brain Tumors

9 Dec 2020-19 Azar 1399
Presenter : Hossein Mozdarani, PhD
Title: Stochastic nature of biological consequences of low dose ionizing radiation exposures

16 Dec 2020-26 Azar 1399
Presenter : Navid Sarmast Alizadeh,MSc
Title:*Thorax Imaging Tips & Tricks*Dose optimizing,Low dose CT,CTAHRCT,MRI pulse sequences

23 Dec 2020-3 Day 1399
Presenter : Javad Ghasemi,BSc
Title: Multi phase CTscan in abdomen

28 Dec 2020-8 Day 1399
Presenter : Khosro Adelian,BSc
Title: Cardiac CT Angiography

2 Jan 2020-13 Dey 1399
Presenter : Fatemeh Pakniat,PhD
Title: Radiation Indused Bystander Effect and Mechanisms

INVITED LECTURE ABSTRACTS

Breast MRI pitfalls and common errors

Vahid Shahmaei, MS.c of Medical Imaging (MRI)

MRI of the breast has evolved into an important adjunctive modality with multiple indications in breast imaging, as recommended by American and European guidelines. Breast MRI is currently the most sensitive detection technique for breast cancer diagnosis.
like other types of MR modalities, there are a number of technical artifacts and pitfalls that can potentially limit interpretation of the images by masking or simulating disease. Because of the coils and computer-aided detection software specific to breast MR imaging, there are more technical considerations that are exclusive to this type of MR imaging.
Motion and phase mipmapping artifacts, aliasing artifact, susceptibility artifact, inhomogeneous fat saturation, incorrect contrast agent selection, poor timing of the contrast bolus, incorrect positioning and poor shimming for breast implant evaluation are some of the artifacts and pitfalls that can make analysis of breast MR images challenging and lead to misdiagnosis.

another important consideration in proper analysis of breast MR images include acquisition of a proper medical history, knowledge of benign and abnormal lesion enhancement, morphologic versus kinetic assessment, evaluation of areas outside the breast, knowing the physiology and anatomy of normal breast parenchyma, menstrual cycle, also review key features and means of evaluating breast density,
fibroglandular tissue, and BPE at imaging; to detail how endogenous and exogenous hormonal stimuli may affect breast density, fibroglandular tissue, and BPE, potentially affecting radiologic interpretation.

By using the recommended strategies, MRI tech can reduce or eliminate common artifacts and pitfalls in breast MR imaging that prevent proper interpretation of the results of this important diagnostic modality.

PET in Oncology

Ali Shabestani Monfared
Professor of Medical physics, Babol University of Medical Sciences

This article tries to show some applications of Positron Emission Tomography in Oncology. PET plays a unique role in tumor imaging and its staging as well as response to treatment. PET also provides excellent information about function of tumor in oncology. To image the tumor by PET special radiotracer like FDG should be used. The role of PET in Oncology is undeniable and it seems that its role in oncology be more considerable in near future using new positron emitters.

Key words: Positron Emission Tomography, Oncology, Tumor

REVIEW OF IMAGING STRATEGIES IN BRAIN TUMORS

Hedayatolah Soroush,MSc

It is important to distinguish tumoural from non-tumoural lesions, and to determine their spatial location. New, advanced imaging CT and MRI techniques provide more detailed characteristics of brain tumours, and thus, more choices of appropriate therapeutic management of the patient. These techniques also play a significant role in monitoring the effect of the therapy.

Diagnosis of tumours has improved considerably due to the introduction of new imaging CT and MRI techniques. These techniques, and the contrast medium in particular, provide anatomical and structural information about brain tumours, and information about the physiology, metabolism, and haemodynamics of individual tumours.

Ultrasound is a widely available, non-invasive diagnostic method without negative biological effects. Principally, it is applied, in the primary examination of the brain in prenatal and postnatal diagnoses, and in the examination of cerebral arteries. Currently, ultrasonography, used in planning operational strategy and choice of neurosurgery access, has been replaced by new, and more accurate, neuronavigation systems using MRI data.

Technological improvements and new CT applications in neuroradiology are mainly related to CT angiography and CT perfusion with a dynamic contrast agent bolus.

The main advantages of MRI are the possibilities of imaging individual anatomical regions in vivo with high tissue contrast, imaging in arbitrary planes, non-invasivity, and the absence of demonstrable detrimental effects on human health. Qualitative evaluation of tissues allows for four basic physical attributes: T1 and T2 relaxation, proton density, motion, and flow.

Conventional MRI techniques provide information about the anatomical conditions of brain tissue, the tumour itself, and its relationship with its surroundings.

Advanced magnetic resonance techniques in neuroradiology evaluate changes at the microvascular, haemodynamic, and cellular levels of brain tumours, and in addition to structural changes, evaluate changes at the metabolic and biochemical levels.

DTI is an advanced magnetic resonance technique that allows visualization of white matter tracts, and describes the movement of water molecules by using two parameters, mean diffusivity (MD) and fractional anisotropy (FA), which represent the directionality of water diffusion.

DTI is an advanced magnetic resonance technique that allows visualization of white matter tracts, and describes the movement of water molecules by using two parameters, mean diffusivity (MD) and fractional anisotropy (FA), which represent the directionality of water diffusion.

With PWI it is possible to determine tumour grading non-invasively. In general, high-grade tumours have higher CBV values than low-grade tumours. PWI is also used for localization of the parts of a tumour with a high degree of vascularity for the purpose of stereotactic biopsy. PWI helps to define the edge of a tumour, which is important in planning surgical treatment radiotherapy. PWI is also used to monitor the effect of treatment on patients.

MRS is a non-invasive method and currently is part of the advanced diagnostic protocol in neuroradiology. MRS can determine pathological changes in brain tissue long before conventional techniques.

Presently, in tumour imaging, fMRI is used predominantly for the preoperative localization of eloquent cortical regions that may have been displaced, distorted or compressed by the tumour.

Neuronavigation is a common method of preoperative localization of brain tumours. It uses imaging materials of preoperative MRI examinations, 3D sequences and DTI and fMRI data, that are transferred to a computer database of a neuronavigation device.

DSA is used to detect the blood vessels supplying the brain tumours, and also to control the hypervascular tumour embolization.

Stochastic nature of biological effects of low dose ionizing radiation exposure

Hossein Mozdarani, Ph.D
Department of Medical Genetics, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran

Exposure to ionizing radiation leads to induction of biological effects directly or indirectly which eventually express as deterministic or stochastic effects. Radiation protection, dose limits are set to limit stochastic effects to an acceptable level to prevent deterministic effects. At low, radiation risks are primarily stochastic effects, in particular, Genetic and somatic effects rather than the deterministic effects characteristic of higher-dose exposure. The growing use of ionizing radiation in medicine both in the aspects of imaging and therapy has led to the exposure of many individuals to low-level ionizing radiation occupationally or at general population level. The nature of stochastic effects of ionizing radiation is stochastic from impartation of energy at cellular level. It is possible that exposure of ionizing radiation imparts energy but the energy does not lead to direct effect or water radiolysis or free radical formation. Formation of free radicals does not mean induction of biological effects because it might be far away from critical molecules or may be scavenged by an antioxidant. However, if cellular damage occurs by free radicals of direct effects of radiation, cellular repair processes would be able to repair quite a lot of damages, and only few of them might be left unrepaired. Thus all aspects of physic-chemico-biological effects of ionizing radiation follow random processes which make all steps stochastic. For many years, the cell nucleus, specifically the DNA, has been the principal target for the biological effects of radiation. Damaged DNA is repaired via various repair mechanisms. However unrepaired DNA damages would be converted into a mutation or chromosomal aberration, cellular transformation, cell death and carcinogenesis during subsequent impaired DNA repair. It is commonly stated that “any radiation dose, no matter how small (linear non-threshold model), can cause cancer or genetic diseases.” Experiments have repeatedly shown that exposure to large radiation doses results in an elevated risk of stochastic effects. Radiation apparently does not cause unique types of mutations, but simply increases the mutations rate above their natural rate of occurrence. A number of novel radiation biologic responses might affect the shape of the dose-response curve for stochastic effects at low doses. Low-dose hypersensitivity has been shown to occur for cell killing, that is the result of a failure to activate repair processes and will very likely effectively remove any potentially genetically altered cells by programmed cell death. Observations of responses in neighbouring cells (Bystander effects) that have not been directly hit have led to suggestions that at low doses these nontargeted effects could contribute to the adverse consequences of radiation exposure. Adaptive response has been documented in vivo and in vitro which observed that generally, the protective effect of the conditioning dose appears to last only for a few hours, and the ability to induce an adaptive response differs between individuals, with some failing to respond at all. Therefore, the nature of induction of biological effects at low dose ionizing radiation and expression of unrepaired cellular damages under the control of biological processes such as adaptive response or bystander effect as well as inherent radiosensitivity make all the process stochastic.

Keywords: Low dose ionizing radiation, Stochastic effects, biological modifiers, LNT hypothesis

MRI and CT of Thorax Tips & Tricks

Navid Sarmast Alizade MS.c of Medical Imaging (MRI)
Mohammad Akbarnejad PhD Candidate

In the recent years, with the development of ultrafast sequences, magnetic resonance imaging (MRI) has been established as a valuable diagnostic modality in Lung imaging. The main advantage of MRI of the lungs is its unique combination of morphological and functional assessment in a single imaging session. In this abstract, we review most technical aspects and suggest a protocol for performing chest MRI. also the major clinical indications for MRI of the lungs: staging of lung tumors; evaluation of pulmonary vascular diseases; and investigation of pulmonary abnormalities in patients who should not be exposed to radiation. Pulmonary parenchyma imaging represents a unique challenge for magnetic resonance imaging (MRI). Limited signal intensity is caused by low proton density, susceptibility artifacts are due to differences between tissue and air, besides physiological motion (cardiac pulsation, respiration). Recently, further improvements in MRI techniques have widened the potential for investigation of pulmonary parenchymal diseases. Such techniques include very short echo times, ultrafast turbo-spin-echo acquisitions, projection reconstruction technique, breathhold imaging. chemical shift MRI has been described to detect fat in pulmonary hamartomas, MRI is superior to CT for depicting the pericardium, heart, and mediastinal vessels and, therefore, it can be indicated in specific situations such as superior vena cava obstruction, myocardial invasion, or tumor spread into the left atrium via pulmonary veins. The use of MRI allows a comprehensive assessment of pulmonary hypertension; especially when performing MR angiography and perfusion MRI, it is possible to differentiate between chronic thromboembolic pulmonary hypertension and pulmonary arterial hypertension. The various features of pneumonia, such as ill-defined nodules, ground-glass opacities, and consolidations can be easily detected and differentiated by MRI. For MRI of the lung, standard scanners with field strength of 1.5 T and full parallel imaging capabilities are recommended. Although higher field strength, i.e., 3 T, will theoretically increase the signal-to-noise ratio, faster signal decay caused by susceptibility artifacts poses additional obstacles to lung imaging. A basic protocol is mainly based on non-contrast breath-hold sequences ; Balanced steady state free precession (bSSFP), HASTE , T1 3D Vibe, PETRA and free breathing diffusion-weighted imaging. For the visualization of lung parenchyma the observers preferred TrueFISP At both field strengths. VIBE achieved the best rating for the depiction of nodules, HASTE was rated best for the delineation of infiltrates. PETRA enables silent, free-breathing, isotropic, and submillimeter imaging of the bronchi and lung parenchyma with high CNR and SNR and may be an alternative to CT for patients with cystic fibrosis. Computer tomography plays a major role in the evaluation of thoracic diseases, especially since the advent of the multidetector-row CT (MDCT) technology. However, the increase use of this technique has raised some concerns about the resulting radiation dose. the various methods allowing limiting the radiation dose exposure resulting from chest CT acquisitions especially ; iterative reconstruction (IR) algorithms, X-CARE and CARE Dose 4D. HRCT of the lungs can be applied to the diagnosis of both acute and more chronic diffuse diseases of the lung tissue and the airways. The main developments of CT in the chest have been the introduction of high-resolution CT (HRCT) and spiral CT. HRCT is defined as thin-section CT (1- to 2-mm collimation scans), optimized by using a high-spatial resolution (edge-enhancing) algorithm. HRCT currently has the best sensitivity and specificity of any imaging method used for the assessment of focal and diffuse lung diseases.

MULTI PHASE CT SCAN IN ABDOMEN

Javad Ghasemi, BSc, RT
CT SCAN APPLICATION SPECIALIST

This article is going to describe the multiphase CT scanning in abdomen.

Purpose: Since the pattern of blood flow forms in tissues is difference; this technique has helped to elucidate the imaging features of tissues. Dynamic contrast-enhanced CT scanning is preferred to routine CT scanning. When requesting a CT scan to investigate abdominal mass, the physician should inform the radiologist about the need for nonenhanced, arterial, portal venous, and delayed imaging which called multi-phase CT scanning.

The role of multiphase imaging is in characterization of these lesions, so that diagnosing, staging and management of patients. Separating these phases is described by Arteriovenous iodine difference (AVID).

This technique is gold-standard in diagnosing liver lesions (such as hemangioma, HCC and metastasis), pancreatic lesions (such as islet cell tumors) and renal lesion (such as RCC).

Keyword: multi phase, arterial, portal, AVID, hemangioma, HCC, RCC.

Coronary Artery MSCT Angiography and Myocardial Perfusion
Khosro Adelian,BSc

Coronary computed tomography angiography (CCTA) uses an injection of iodine-containing contrast material and CT scanning to examine the arteries that supply blood to the heart and determine whether they have been narrowed. The images generated during a CTA can be reformatted to create three-dimensional (3D) images that may be viewed on a monitor, printed on film or by a 3D printer, or transferred to electronic media.

The heart rate of the patient is an important determinant of image reconstruction quality and for selecting scanning parameters such as pitch and reconstruction algorithms. If the heart rate is too high (>100/min) , a temporal resolution of less 150 msec becomes necessary for motion-free cardiac imaging during diastole. Segmental adaptive reconstruction can be used to improve temporal resolution, but at the expense of volume coverage or longitudinal resolution, to keep scanning time in one breath-hold, If neither can be sacrificed, Beta blocker medication can be administrated orally or IV 1 hr before scanning to reduce heart rate.

Cardiac Gating:

Gating techniques are used to improve temporal resolution and minimize imaging artifacts caused by cardiac motion. Two approaches to cardiac gating are typically used: ***prospective* ECG triggering** and ***retrospective* ECG gating**. The least cardiac motion occurs during diastole, when the ventricles are passively filling. Prospective ECG triggering uses the ECG signal to control scanning, so that X rays are generated and projection data are acquired only during cardiac diastole, more than half the rotation of the gantry. The total number of slices produced per heartbeat during this half rotation of the gantry is proportional to the number of rows of active detectors. Because an axial scanning method (rather than helical) is typically used and the table has to move by the total collimation width after each acquisition, one heartbeat typically has to be skipped between each acquisition. About 12 cm of scanning is required to cover most heart sizes, which requires approximately 48 heartbeats for single-slice CT (5-mm collimation), 24 heartbeats for 4-slice MDCT (2.5-mm collimation each row), and 12 heartbeats for 16-slice MDCT (1.25-mm collimation each row). Thus, multi detector technology can obtain the entire scan during one breath-hold. Electron beam CT requires about 24 heartbeats and can scan the entire heart in one breath-hold. The start of the diastolic phase of the cardiac cycle is estimated from the prior three to seven consecutive heartbeats and occurs approximately 450 msec before the R wave on the ECG.

• The overall accuracy of 64-row CT angiography included a *sensitivity of 87% to 99% and specificity of 93% to 96%.*

• The *negative predictive value* of coronary CT angiography is uniformly high in studies, *approaching 93% to 100%*; in other words, coronary CT angiography is an excellent modality for ruling out coronary disease.
RADIATION RISK DUE TO CARDIAC CT:

1- Radiation doses are higher with MDCT compared with the doses delivered with EBCT and fluoroscopically guided diagnostic coronary angiography (3 to 6 mSv) and similar procedures.

2-Highly dependent on the protocol used in cardiac CT.

3-Calcium scoring:1–3 mSv.

4-For retrospective gated CT angiography: 8–22 mSv and higher.

5-One approach to reduce the high dose associated with retrospective gating is called ECG dose modulation.

6-A 10%–40% dose reduction can be achieved

Artifacts at Cardiac CTA:

1-Motion Artifact: Cardiac Motion; Respiratory Motion; Gross Patient Motion

2- Calcium blooming

3- Beam-hardening artifact

4- Metal or streak artifact

5- Quantum mottle

6- Slab artifact

7- Poor contrast enhancement

8- Artifacts from Overlapping Structure

Myocardial CT Perfusion:

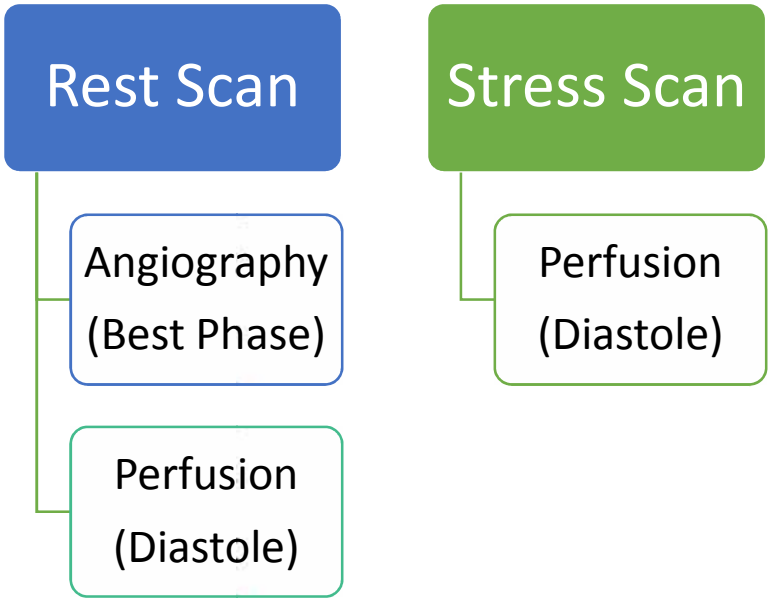
Analysis of the data obtained in the CorE64 multicenter trial demonstrated that more than 25% of the patients examined by either CT angiography (CTA) or catheter angiography required further examination, usually a myocardial perfusion study (Miler et al. NEJM, 2008) For accurate treatment planning, it has been shown that patients with proven myocardial ischemia benefit most from revascularization (Hachamovitch et al. Circulation, 2003).

The ability to perform myocardial perfusion imaging using CT was first described using dynamic CT scanning techniques. However, there are limitations with this approach, with concerns regarding the high X-ray exposure dose and long breath-hold times.

The unique ability of new generation of CT scanners to acquire the entire heart in a single temporally uniform volume permits quantitative myocardial perfusion analysis to be performed with the same data used for coronary CTA. A similar acquisition during pharmacological stress permits the comprehensive evaluation of myocardial perfusion in one examination Comprehensive functional and morphological cardiac analysis with Wide detector CT Scanner can reduce the need to perform multiple examinations in many patients, which saves time and money and minimizes the total exposure dose.

Work Flow:

Myocardial CT Perfusion:



Radiation Induced Bystander Effect: Mechanisms & Challenges

Fatemeh Pakniyat, Medical physics,PhD

Background: The classical paradigm in radiobiology (target theory) has been focused on DNA as the sole target of radiation damage. The recent approach of non-target effects (NTE) which focused on the bidirectional intercellular communication challenged the target theory by introducing phenomenon including adaptive response, hyper-radiosensitivity and bystander effect. "Radiation Induced Bystander Effects" (RIBE) can be defined as the effects seen in the cells that have not directly exposed by the ionizing radiation. RIBEs classified into two types: "Cell/Cell Contact RIBE" as gap-junctions mediated bystander effect (requiring cell-to-cell communication); and "Medium Transfer RIBE" as mediated by diffusible factors that were released from directly irradiated cells to the bystander ones (not requiring cell-to-cell contact).
The distant bystander effect has been defined as abscopal or out-of-field phenomenon and it might result in several challenges in radiotherapy, because local radiotherapy of one tissue involved in a response in another tissue remote from the irradiated site (including distant tumor and distant normal tissue effects).

Results: The exact RIBE mechanism was not completely revealed but it might be involved in the role of 1- DNA damage repair and cell cycle regulation molecules including ADP-ribose Polimerase (PARP), DNA-PK, (XPG)ERCCS, ATM and etc. 2- free radicals particularly ROS (reactive oxygen species) and RNS (reactive nitrogen species), 3- mitochondria, 4- immune system in terms of cytokines including IL-1, IL-2, IL-6, IL-8, TNF-α, TGF-β ;and 5- expression of bystander genes including DNA Damage repair, cell cycle arrest & checkpoint, antioxidant, apoptosis genes as well as inflammation pathway genes.

Conclusion: RIBE might be detrimental because it could result in genetic susceptibility, oncogenic transformation, mutations and chromosomal aberrations in adjacent or distant normal tissue and bystander signaling might be a predisposing factor for carcinogenesis and second cancer incidence! But the deleterious effect of bystander signaling on distant tumor cells may lead to growth inhibition and apoptosis and as a result metastasis regression could be occurred. If the exact mechanism and effect of RIBE be explained clearly, it might lead to a new approach in the treatment planning modification. However, it waited an additional number of studies.

SCIENTIFIIC ORAL ACCEPTED ABSTRACTS
IRSA 18

Paper ID: 19

Investigating the effect of near infrared photo thermal therapy folic acid conjugated gold nano shell on melanoma cancer cell line A375

Fateme Sadat Majidi Dorcheh*
(iran university) < fs.majidi695@gmail.com>

Abstract

Background:

Nowadays, there is growing interest regarding the use of metal Nanoshells as targeted agents of Nano- photo thermal cancer therapy. This study was aimed at synthesis the folic acid (FA)-conjugated with sil- ica @gold core-shell nanoparticles (FA-SiO2@AuNPs) for improving the treatment of melanoma cancer cells. The characterization data showed that the FA-SiO2@AuNPs is spherical in shape and its size is 73.7nm. The intracellular uptake of FA-SiO2@AuNPs into melanoma cells (A375) was measured through the inductively coupled plasma, (47.7%). The cytotoxicity of nanoparticles was investigated on A375 and HDF (Human dermal fibroblast) cell lines. Cytotoxicity results indicated that there is no significant cytotoxicity in HDF cell lines treated with nanoparticles. MTT and flow cytometry results showed that the viability of A375 cells treated by SiO2@Au and FA-SiO2@AuNPs was decreased signifi- cantly to about 31% and 16% respectively. The higher toxicity of cancer cells was obtained for the cells exposed to 808nm near-infrared (NIR) laser after incubation with FA-SiO2@AuNPs rather than the non- targeted SiO2@AuNPs. Furthermore, about 64% more cell death was observed for A-375 cells using both photothermal therapy and treatment with FA-SiO2@AuNPs compared to photothermal therapy. Additionally, the majority of the cell deaths were related to the apoptosis process, not necrosis. It can be concluded that FA-SiO2@AuNPs was an effective targeting agent for photothermal therapy in the treatment of melanoma.

Paper ID: 20

Application of magnetic resonance spectroscopy (MRS) for evaluating metabolic alteration in Prefrontal cortex (PFC) in major depressive disorder (MDD)

Sina Ehsani*
(Mashhad University of Medical Sciences) < sinaehsani350@yahoo.com>

Erfan Saatchian
(Mashhad University of Medical Sciences) < erfan.saatchian@yahoo.com>

Abstract

Background:

Previous studies have determined the neurochemical metabolite abnormalities in major depressive disorder (MDD). The results of studies are inconsistent. Severity of depres¬sion may relate to neurochemical metabolic changes. The aim of this study is to investigate neurochemical metabolite levels in the prefrontal cortex (PFC) of patients with mild/moderate MDD.
15 patients with mild MDD, 13 patients with moderate MDD, and 11 matched control subjects participated in the study. Patients had had their first episode. They had not taken treatment. The severity of depression was assessed by the Hamilton Rating Scale for Depression (HAM-D). Levels of N-acetyl aspartate (NAA), choline-containing compounds (Cho), and Creatine (Cr) were measured using proton magnetic resonance spectroscopy (1H-MRS) at 1.5 T, with an 8-cm3 single voxel placed in the right PFC.
The moderate MDD patients had lower NAA/Cr levels than the control group. No differences were found in neurochemical metabolite levels between the mild MDD and control groups. No correlation was found between the patients' metabolite levels and HAM-D scores.
Our findings suggest that NAA/Cr levels are low in moderate-level MDD in the PFC. Neurochemical metabolite levels did not change in mild depressive disorder. Our results suggest that the severity of depression may affect neuronal function and viability. Studies are needed to confirm this finding, including studies on severely depressive patients.

Keywords: major depressive disorder, magnetic resonance spectroscopy

Paper ID: 21

Metabolite alternations in Mild Traumatic Brain injury, by Magnetic Resonance Spectroscopy

Sina Ehsani*
(Mashhad University of Medical Sciences) < sinaehsani350@yahoo.com>

Erfan Saatchian
(Mashhad University of Medical Sciences) < erfan.saatchian@yahoo.com>

Abstract

Background:

Mild Traumatic brain injury (MTBI) is one of the common neurotraumatological diagnosis and cause of disabilities in adults which if the person survives, following aftermaths like neuropsychological dysfunction with objective impairment of attention, memory and selected executive functions remain as a threat. MRI is not routinely prescribed in patients after MTBI in spite of higher sensitivity and specificity in comparison to CT scan. Magnetic Resonance Spectroscopy is capable to detect the minute alternations in metabolites. Noninvasive assessments of main metabolites such as NAA, Cho, Cr, Lac and lip reveal the brain metabolisms pathway by the time and helps to predicts the outcome and prognosis prior any observable damages be appeared. In preset survey, we deal with the changes of metabolites in acute stage of TBI and their interpretations. Related studies were collected from 2013 to 2018 and significant changes considered then presented in tables. NAA dramatically reduced after MTBI. Also, Cho correlates with the poor prognosis and increased with severity of Trauma. Lac for mitochondrial dysfunction and lip as a cell membrane disruption biomarker elevated post TBI ($p<0.05$). As a whole MRS has a potential to detect changes in metabolites following TBI at acute stage.

key words: TBI, MRS, Metabolite alternations

Paper ID: 22

Grading of Gliomas by Using Radiomics Features On CT Scan

Mohammad Maskani*
(Mashhad University Of Medical Sciences) < maskanim961@mums.ac.ir>

Hoda Zare
(Mashhad University Of Medical Sciences) < zareh@mums.ac.ir>

Alireza Montazerabadi
(Mashhad University Of Medical Sciences) < montazerabadia@mums.ac.ir>

Amir Zamanpour
(Mashhad University of Medical Sciences) < amirzamanpuor@gmail.com>

Hamid Abdollahi
(Kerman University Of Medical Sciences) < hamid_rbp@yahoo.com>

Hamid Etemadrezaie
(Mashhad University Of Medical Sciences) < etemadrezaieh@mums.ac.ir>

Abstract

Background:

Introduction: Glioma is the most common primary central nervous system malignancy. Grading of Glioma is critical for treatment decision and determine the next step of treatment procedure. Radiomics is non-invasive method to reach clinical information by extract meanable data from clinical images. We aimed to determine the glioma grading by using Radiomics on Contrast-Enhanced CT Scan images.
Material and Method: we used Contrast-Enhanced Brain CT scan images of patient pathologically proven gliomas. We used Histogram and Textural features were extracted by using Pyradiomics. Significant Features were selected through L1-norm regularization (LASSO). We used significant features to build our model for grading of gliomas.
Result: These significant features demonstrate the high prediction performance of our method. We obtain accuracy 93% - AUC 0.98 with classifier model to distinguish between low-grade and high-grade gliomas.
Conclusions: Glioma grading could be accurately determined using Radiomics approach. The result of our study show that radiomics on CT scan images is suitable method for non-invasively assessing brain tumor diagnosis. This study introduce a new tool for radiologists to diagnose grading of gliomas.

Paper ID: 30

PEDIATRIC DOSE ASSESSMENT IN COMMON CT EXAMINATIONS FOR THE PURPOSE OF MEDICAL EXPOSURE OPTIMIZATION IN TEHRAN, IRAN

Atefeh Tahmasebzadeh*
(Iran University of medical science) < tahmasebzade@gmail.com>

Reza Paydar
(Iran University of medical science) < paydar57@gmail.com>

Abstract

Background:

Introduction: Nowadays computed tomography (CT), is considered as important and practical diagnostic tool in medical imaging sciences by presenting three dimension images. Since the dose of this type of imaging is higher than other modalities, radiation protection plays an important role, epically in children as the most sensitive groups to radiations harmful effects.
Methods: In this study, the dose of exposed organs to radiation during prevalent CT scan procedures (head, chest, and abdomen-pelvic) in five pediatric medical imaging centers in Tehran province was evaluated. Pediatrics was divided into four age groups <1years; 1-5years; 5-10 years and 10-15 years and the dose of organs and effective doses of each scan were calculated by NCICT dosimetry software.
Results: Considering all the scans the dose received by uterus 19.51 mGy, brain17.64 mGy, colon17.58 mGy, and ovaries 17.3 mGy had the highest dose respectively. In head scans, the dose of the brain in 1 to 5 year age group(17.64 mGy), in chest scans the dose of the thyroid gland in 10 to 15 year age group(11.46 mGy) and the dose of the uterus(19.51mGy) in abdomen-pelvic scans in <1 year age group received the higher dose in comparison to other organs. Also, the dose of bone marrow in chest and abdomen-pelvic scans increased by age but it showed the opposite pattern in head scans. The dose of the thyroid gland in head scans and the dose of bone marrow in chest and abdomen-pelvic scans had the lowest dose in comparison. The effective dose increased by age in chest and abdomen-pelvic scans but it had the opposite pattern in head scans. Abdomen-pelvic scans had the highest effective dose in comparison to head and chest scans.
Conclusions: Although CT scans play an important role in medical imaging, because of imposing a higher level of radiation dose on sensitive organs such as thyroid gland and uterus during scan procedures dose optimization is necessary, and also the variations in dose between CT departments as well as between identical scanners suggest a large potential for optimization of examinations. The data of this study can be of great help in this regard.

Paper ID: 31

Comparative Assessment of the Influences of Iterative Model Reconstruction (IMR) and Hybrid-Iterative Reconstruction (HIR) on Image Quality of 256-Slice Coronary Computed Tomography Angiography

Mohammad Askarzade*
(kerman university of medical sciences) < moh.askarzadeh@gmail.com>

Abstract

Background:

Background: The aim of this study was to evaluate the influences of iterative model reconstruction (IMR) and hybrid-iterative reconstruction (HIR) techniques on quantitative and qualitative image analysis of 256-slice coronary computed tomography angiography (CCTA).

Methods: Sixty-one patients (30 men and 31 women with mean age of 60.68 ± 9.13 years) who had undergone CCTA by the 256-slice CT scanner were evaluated. The raw data were reconstructed using HIR and IMR algorithms. For objective assessment of image quality, parameters of noise, signal-to-noise ratio (SNR), and contrast-to-noise ratio (CNR) were obtained for both reconstruction algorithms. For subjective assessment, two physician specialists evaluated image quality using a 5-point scale.

Findings: The mean image noise on HIR and IMR images was 32.74 ± 6.04 and 25.15 ± 3.59, respectively. In IMR, the CNR method (28.81 ± 5.13) was significantly better than HIR method (23.06 ± 5.03) ($P < 0.001$). However, the HIR method (4.62 ± 0.39) was higher than the IMR method (4.48 ± 0.45) in terms of qualitative or subjective criteria ($P < 0.001$).

Conclusion: The IMR method can improve quantitative criteria of image, reduce noise, and increase SNR and CNR of images better than HIR method. However, the images which reconstructed by HIR were superior to IMR in terms of qualitative criteria.

Keywords: Coronary vessels, Computed tomography angiography, Image reconstruction, Image quality enhancement

Paper ID: 39

The Compressed Sensing Technology: A Review of Concepts and Clinical Roles in Magnetic Resonance Imaging

Vahid Shahmaei**
(sbmu) < vahidshahmaei.sbmu@gmail.com>

Forough Sodaei
(Tehran University of medical sciences) < foroughsodaei@gmail.com>

Abstract

Background:

Magnetic Resonance Imaging (MRI) is one of the most dynamic and safe imaging techniques available in the clinic today. Scan time for MRI with an inherently slow data acquisition process is a major concern at present. Imaging speed is important in many MRI applications. However, the speed at which data can be collected in MRI is fundamentally limited by physical and physiological constraints and also is directly related to the number of data samples measured, therefore, seeking for methods to reduce the amount of acquired data without degrading the image quality and collecting fewer measurements enables faster imaging. Hence there is a need for compression. A recent development in the field of signal processing shows that it is possible to reconstruct the signal with very few samples collected without reduction of the signal quality. The introduction of compressed sensing for increasing imaging speed by reconstructing signals and images from significantly fewer measurements than were traditionally thought necessary in MRI has raised significant interest among researchers and clinicians and has initiated a large body of research across multiple clinical applications over the last decade. This paper reviews the basic concepts of compressed sensing and its potential clinical roles in MR imaging.

Methods

The different websites such as PubMed, Google scholar, and Elsevier were visited for a systematic search. In this review, about 130 articles were obtained through entering keywords, and with further review, 30 studies were selected.

Findings

This technique enables shortened scan durations, improved image resolution by denoising properties, and increase the diagnostic information and value from each scan performed. However, a number of challenges exist when moving compressed sensing from research to the clinic. The recent FDA approval of compressed sensing products for clinical scans reflects the maturity of this technology. Up to now, the potential of compressed sensing has been shown in a large number of applications from 2D to 5D imaging. There are some applications where compressed sensing improves on current MRI techniques such as dynamic contrast-enhanced MRI (DCE-MRI), pediatric MRI, MR angiography, MR spectroscopy of the brain and prostate, phase-contrast MRI for cardiac imaging and vascular flow quantification, chemical shift imaging, contrast-enhanced multiphase MRI of the liver and brain MRI.

Conclusion

We conclude that applying compressed sensing to MRI offers potentially significant scan time reductions, with benefits for patients and clinical settings economics.

Keywords: Magnetic Resonance Imaging, Compressed Sensing

Paper ID: 58

Folic acid-conjugated nanoparticles as targeted drug delivery system for glioblastoma

Soraya Emamgholizadeh Minaei*
(Urmia University of Medical Sciences) < minayee.s@gmail.com>

Abstract

Background:

Introduction: Glioblastoma multiforme (GBM) is known as the most frequent malignant tumor of the brain. GBM has the infiltrative and proliferative nature. Therefore its treatment is one of the most problems in cancer therapy. Temozolomide (TMZ) is an alkylating antineoplastic agent that are used for the treatment of GBM tumor. However, the clinical outcome in the treatment of GBM is disappointing due to the difficulty of delivering chemotherapy agent across the blood-brain barrier. In this study, folic acid-conjugated nanoparticles were prepared for carrying chemotherapy agent in the body.
Materials & Methods: TMZ-loaded folic acid-conjugated magnetite nanoparticles (FA-TMZ-SPION NPs) were characterized by Dynamic Light Scattering (DLS) analysis and transmission electron microscope (TEM). The folic acid conjugation was confirmed by nuclear magnetic resonance (NMR) analysis. To identify the targeting effect of FA-conjugated NPs, C6 glioblastoma cells and OLN-93 normal glial cells were used. The cellular uptake of NPs was determined by the ICP-OES. In addition, in vitro therapeutic efficacy of nanoparticles was evaluated by flow cytometry analysis.
Results: The particle size of nanoparticles was 40 nm and nanoparticles had spherical shape. The drug loading capacity and TMZ encapsulation efficiency of FA-TMZ- SPION NPs were 6.3 and 51%, respectively. Cellular uptake of Fe after 24 h incubation with SPION NPs was 62.3 ± 2.2 and 64.36 ± 2.3 pg/cell for C6 and OLN-93 cells, respectively. Whereas, for FA-conjugated NPs (at the same concentrations of Fe) was 109.36 ± 3.4 and 67.7 ± 1.57 pg/cell, respectively. The therapeutic studies in C6 cells showed that FA-TMZ-SPION NPs significantly increased cell death compared to TMZ free.
Conclusion: We demonstrated that TMZ-loaded folic acid-conjugated magnetite nanoparticles enhanced the transportation of TMZ into C6 glioblastoma cells due to the over-expression of FA-receptors on the surface of cancer cells.

Keywords: Glioblastoma, Folic acid, Temozolomide, Nanoparticle

Paper ID: 59

Utilization of manganese oxide nanoparticles in MRI

Nahideh Gharehaghaji*
(Radiology Department, Paramedical Faculty, Tabriz University of Medical Sciences) < gharehaghaji@gmail.com>

Mahdi khalilneghad
(Tabriz University of Medical Sciences) < mahdi.radiology92@gmail.com>

Ramin Ghasemi Shayan
(Radiology Student , Paramedical Sciences Faculty, Tabriz University of Medical Sciences, Tabriz, Iran) < raminghasemi1377@gmail.com>

Abstract

Background:

Introduction: MRI as a powerful imaging modality provides high spatial resolution images of soft tissues. However, it suffers from low sensitivity limitation. MRI contrast media used to overcome low sensitivity of MR imaging. Commercial gadolinium chelates have been widely used as contrast materials in clinical MRI. Nowadays, with development of nanotechnology, magnetic nanomaterials have been investigated for contrast enhanced MRI. This study reviews the utilization of the manganese oxide nanoparticles in MRI as contrast material.
Materials and Methods: The search was done using the words of “manganese oxide nanoparticles”, “contrast material/agent” and “MRI” in PubMed, Science Direct, Scopus, ISI Web of Science and Springer data sets during 2010-2020 to identify appropriate studies.
Results: Different types of manganese oxide nanoparticles including MnO, MnO2 and Mn3O4 have been investigated as MRI contrast materials. Manganese oxide nanoparticles are less harmful than their lanthanide partners. In addition, they show rapid exchange rate of water protons. Therefore, because of the relationship of the commercial gadolinium chelates with nephrogenic systemic fibrosis, manganese oxide (MnO) nanoparticles can be considered as an appealing alternative for T1 relaxation time shortening. Hence, they have gotten an alluring subject as T1 contrast material.
Conclusion: Study results demonstrate that manganese oxide nanoparticles have potential for utilization as T1 contrast materials in MRI.
Keywords: Manganese oxide nanoparticles, Contrast material, MRI

SCIENTIFIIC POSTER ACCEPTED ABSTRACTS
IRSA 18

Paper ID: 23

Factors Affecting the Contrast of Radiographic Imaging in Analog and Digital Radiology: The Impact of kV Changes

Mehri Faraji *
(tbzmed) < M.faraji1361@yahoo.com>

Abstract

Background:

In radiography images , Contrast and density are the most important characteristics . Contrast is the difference between darkness and brightness. To investigate the effect of kilo voltage changes on the contrast of radiographic images in both analog and digital radiology systems. Due to the applied nature of the current study, radiographic study of the distal region of bone of the right arm with approximately the same gender, physical and age conditions of 18 patients, using two types of analog and digital radiographic systems with 10 kilo voltage type with a 1 kV difference and fixed FFD and mAs was performed. the intensity of brightness of images were analyzed by MATLAB software. The density and difference of visual contrast of diaphysis, metaphysis and epiphysis areas were divided by three lateral, central and medial zones. The results of Pearson correlation test showed that there was no significant relationship between kV and diaphysis contrast (r = 0.50, p = 0.17), metaphysis contrast and kV (p = 0.27 and r = 0.41), kV and epiphysis contrast in analogue radiology (r = 0.50, p = 0.17). Pearson correlation results showed that there was no significant relationship between kV and diaphysis contrast (p = 0.14 and r = 0.53), kV and metaphysis contrast (r = -0.18, p = 0.65), kV and epiphysis contrast in digital radiology (r =-0.64 and p = 0/066). Independent t-test results showed that diaphysis contrast in digital radiology was significantly higher than that of analogue radiology (p = 0.001, but metaphysis contrast and epiphysis contrast were not significantly different in digital radiology and analogue radiology (p = 0.676), (p = 0.992). According to the results of the radiographic image obtained for elongated bones of epiphysis area, the digital system was preferable whereas for examination of metaphysis and epiphysis regions, the results of the analog system were approximately equal to those of the digital system. In this study, the average kilovoltage used in the analog system was lower than that of the digital system but in general, we have to reduce the kilovoltage to have higher contrast, which increases the absorbed dose of the patient, while the higher kilovoltage in the digital system reduces the event of the photoelectric phenomenon and the absorbed dose of the patient.It was concluded that in the pathological or traumatic cases of the elongated bones of the diaphysis area, the digital system should be used more to have higher contrast, and although the analogue system is also suitable for metaphysis and epiphysis areas, it is better to use digital system to reduce the dose received by the patient.
Keywords: Contrast, analog radiography, digital radiography, kilo voltage changes.

Paper ID: 37

Nano shields in radiotherapy

Nahideh Gharehaghaji*
(Radiology Department, Paramedical Faculty, Tabriz University of Medical Sciences) < gharehaghaji@gmail.com>

Fatemeh Bakhtiari-asl
(tabriz university of medical sience) < fatemehbaxtiari@gmail.com>

Abstract

Background:

Introduction: Exposure to high doses of ionizing radiations may lead to many biological effects; thus, sufficient protection against ionizing radiations is necessary in radiation therapy. In the past years, concrete has been widely used as a conventional shielding material in radiation therapy. Recently, due to the development of nanotechnology, different nanoparticles have been investigated as shielding materials used in radiotherapy. The purpose of this review is to survey the use of nanoparticles for shielding applications in radiotherapy.
Materials and methods: The articles published during 2007-2020 were identified via searching in databases such as Google Scholar, PubMed, Web of Science, and Scopus using keywords including nano shield, radiotherapy, shielding materials and radiation protection. After the selection of the related studies, the required data were extracted and summarized.
Results: In total, 8 articles were selected from the identified articles and reviewed. Two of these articles were experimental studies and the rest were done using Monte Carlo modeling and simulations. Different types of the nanoparticles were investigated in these studies including iron (III) oxide, boron carbide, tungsten trioxide, lead (II) oxide, bismuth, bismuth (III) oxide, bismuth borates and boronium. These nanoparticles were mixed with various matrices, such as concrete, silicone rubber and epoxy resin. Compared to ordinary concrete, all the nanomaterials showed enhanced attenuation properties for all studied photon energies.
Conclusion: According to the obtained results, there is a great potential for application of nanomaterials as ionizing radiation shield in radiotherapy.
Keywords: Nano shield, Radiotherapy, Shielding materials, Radiation protection

Paper ID: 40

Enhancing Magnetic Resonance Neuroimaging with Artificial Intelligence: a Review of Impact on Image Quality

Forough Sodaei *
(*Tehran University of medical sciences) < foroughsodaei@gmail.com>*

Vahid Shahmaei
(sbmu) < vahidshahmaei.sbmu@gmail.com>

Abstract

Background:

Artificial intelligence (AI) is a branch of computer science that encompasses machine learning, representation learning, and deep learning. Recently, deep learning methods have shown great potential in various tasks that involve handling large amounts of digital data. In the field of Magnetic Resonance Imaging (MRI) research, deep learning methods are also rapidly being applied to complement traditional model-based methods. The last decade has seen a rapidly expanding range of MR Neuroimaging techniques of the human brain, providing new insights into brain structure, connectivity, and metabolism. The MR Neuroimage quality can be affected by a wide variety of artifacts that may lead to an incorrect diagnosis. Deep learning methods have shown remarkable improvements in several MR image processing areas such as image reconstruction, image quality improvement. MRI has unique characteristics of artifacts due to its spatial encoding schemes and reconstruction algorithms. One of the most common artifacts in MRI is caused by various motions of a subject, which results in the pernicious construction of a k-space, leading to contamination of the entire image. MR Neuro images often suffer from low signal-to-noise ratio, such as DWI and 3D MR images. Denoising is one of the most important aspects of image quality improvement. In practice, generally, the MR signals are always perturbed by various unwanted noises, and image denoising can be considered as an inverse problem of finding the values of the signal minimizing noise contaminations. This article will seek to present an overview of deep learning applied to neuroimaging techniques.

Methods

The different websites such as PubMed, Google scholar, and Elsevier were visited for a systematic search. In this review, about 125 articles were obtained through entering keywords, and with further review, 20 studies were selected.

Findings

In contrast-enhanced brain MRI techniques, the deep learning algorithm is able to extract diagnostic quality images with gadolinium doses 10-fold lower than those typically used. Another MRI acquisition suffering from an inherently low-signal-to-noise ratio is arterial spin labeling (ASL) perfusion imaging. ASL has been used increasingly in neuroimaging because of its non-invasive and repeatable advantages in quantification and labeling. Repeated measurements of control/spin-labeled paired can lead to fair image quality, but with the risk of motion artifacts. The deep learning methods could reduce artifacts and improve the resolution and the peak signal-to-noise ratio of ASL by up to 50%. MR spectroscopic imaging (MRS) can measure endogenous metabolite concentration in vivo in brain tumors and other neurological diseases.

Conclusion

We conclude that the deep learning methods are reported to show superior performances in MR Neuroimaging quality.

Keywords: Magnetic Resonance Imaging, Neuroimaging, Artificial Intelligence, Image Quality

Paper ID: 42

Identification of penumbra in acute ischemic stroke using multimodal MR imaging analysis: A case report study

Vahid Shahmaei*****
(sbmu) < vahidshahmaei.sbmu@gmail.com>

Forough Sodaei
(Tehran University of medical sciences) < foroughsodaei@gmail.com>

Abstract

Background:

Ischemic etiology of stroke is the most common health issue.
Differentiating the ischemic core from the associated penumbra is tremendously important in tailoring an effective therapeutic strategy and potential intervention. Additionally, the degree of cell damage adjacent to the ischemic core may be either reversible or irreversible, which may also affect clinical outcomes.
We describe a case of a 58-year-old female, who was diagnosed with global aphasia and fluctuating right-sided hypoesthesia. Multimodal MR imaging analysis was obtained, with cerebral blood flow and mean transit time , demonstrating an infarcted core with an even larger penumbra, suggesting potentially salvageable tissue. We concluded that quantified perfusion imaging data should be used in combination with other MR protocols to determine at-risk tissues.
This case substantiates the role of multimodal imaging of the penumbra as a routine part of acute stroke workup and management.

Paper ID: 44

Role of Arterial Spin Labeling (ASL) perfusion imaging in Alzheimer's disease

Vahid Shahmaei*****
(sbmu) < vahidshahmaei.sbmu@gmail.com>

Forough Sodaei
(Tehran University of medical sciences) < foroughsodaei@gmail.com>

Abstract

Background:

Alzheimer's disease (AD) is the most common cause of dementia and the fifth leading cause of death in people aged 65 years and older.
Arterial spin labeling (ASL) is the non-invasive method that uses arterial blood water as an endogenous tracer to measure cerebral blood flow (CBF).
Arterial spin labeling (ASL) MR imaging is a non-invasive, rapid and increasingly widely available method for quantifying cerebral blood flow; ASL represents a potential alternative modality for measuring brain perfusion as compared with positron emission tomography (PET).
Quantitative imaging of cerebral blood flow, using standard magnetic resonance imaging (MRI) equipment because it requires no contrast injection, ASL can add resting functional information to MRI studies measuring atrophy and signs of ischemic injury. Key features of ASL technology that may affect studies in Alzheimer's disease are described. ASL is proving to be an increasingly promising tool for exploring pathogenetic mechanisms, early detection, monitoring disease progression and pharmacological response and differential diagnosis of AD.
The most consistent finding across the studies of AD is decreased precuneus and/or posterior cingulate blood flow and lower posterior CBF at the time of diagnosis show a more rapid cognitive decline. Some of the regions with the slowest arrival are those that also show flow decreases in AD, such as parietal and frontal association cortex.
Since MRI scanners are more widely available than PET scanners (and also less expensive), ASL might become an alternative for FDG-PET.
ASL Blood Flow MRI is a promising marker of early disease in AD and other dementias. ASL currently lags some other imaging methods in the maturity of the technology and the evaluation in AD. With widespread distribution of the technique in progress, we anticipate these challenges will shortly be overcome and ASL will become an essential tool in AD treatment and prevention research.
Keywords— Arterial Spin Labeling, Magnetic Resonance Imaging, Cerebral Blood Flow,
Alzheimer's disease

Paper ID: 47

Interpretation of CT scan Findings in Epidemic Crisis of COVID-19

Reza Afzalipour*****
(Hormozgan University of Medical Sciences) < reza.afzalipour@hums.ac.ir>

Ebrahim Nouri
(*Hormozgan University of Medical Sciences) < ebrahim.n3346@gmail.com>*

Omolbanin Delashoub
(Hormozgan University of Medical Sciences) < odelashoub@gmail.com>

Salman Jafari
(Hamadan University of Medical Sciences) < sa.jafari@umsha.ac.ir>

Mohammad Ali Shahabi Rabori
(Kerman University of Medical Sciences) < dardestan_shahab@yahoo.com>

Abstract

Background:

Specialists have identified criteria for the prevention, diagnosis, and treatment of COVID-19 pneumonia with the gradual recognition of the symptoms and complications. COVID-19 pneumonia causes acute respiratory problems like other coronavirus-induced pneumonias. The CT scan of the chest is a common imaging tool for diagnosing pneumonia, which is easily available in almost all areas. The images of the CT scan of the chest, which are accompanied by high speed, quality, and accuracy, allow the radiologist to easily identify the areas involved in the lungs. The CT scan of the chest determines the typical radiological features in patients with pneumonia caused by COVID-19. These features include ground-glass opacity, multifocal patchy consolidation, and interstitial changes with peripheral distribution. The highest incidence is in the 4th and 5th lobes, where about 50% to 75% of the lesions occur.

The CT scan protocol for patients with the disease is the use of the HRCT technique in the inspiration phase with spiral 4-slice devices and higher. Scan parameters also include KV:100-120, and mAs:20-30, thickness = 1-2mm, spiral, single breath hold, and Pitch=0.8-1.5, which were determined for all patients.

Given that there are restrictions on the use of ionizing radiation for pregnant women, it is recommended to initially conduct PCR tests. If necessary, typical radiography with an abdominal shield can be used for women in the first trimester of pregnancy, and the HRCT technique as low does can be used for the second and third trimesters of pregnancy.

Keywords: COVID-19, CT scan, typical symptoms, ground glass, CT scan follow-up

Paper ID: 53

Evaluation of the effect of alloy containing bismuth oxide nanoparticles on X-ray absorption in radiology shields

Omid Zare*
(Hormozgan University of Medical Sciences) < omidzare206@gmail.com>

Reza Afzalipour
(Hormozgan University of Medical Sciences) < reza.afzalipour@hums.ac.ir>

Abstract

Background:

Ensuring the health and safety of health workers plays an important role, In the meantime, ensuring the safety of radiology staff who are in direct contact with hazardous radiation is undeniable. This study was performed to investigate the documentation on the effect of nanoparticle shields on the absorption of hazardous radiation in radiology, and specifically alloy containing bismuth oxide (Bi2O3) nanoparticles has been considered because of its desirable properties.

Method:

Several databases were used to collect the required documents, 15 studies were selected from 42 studies in recent years and based on their relationship with the subject and objectives.

Results:

Studies confirm the effectiveness of nanoparticles in radiation protection in different types of radiological shields. The available findings show the relationship between different parameters of nanoparticles and their effect on radiation absorption, as well as different methods of using these particles in different types of radiological shields.

Conclusion:

The results of studies show that nanoparticles can have a significant effect on the absorption of X-rays in radiology, these particles result in lighter shields with lower cost and lower lead content. In particular, bismuth oxide (Bi2O3) nanoparticles are very efficient at absorbing radiation and reducing the cost of production for shields.

Keywords: Nanoparticles, Bismuth oxide, X-ray, Radiological shields

Paper ID: 55

Nanotheranostics in Brain Cancer

Nahideh Gharehaghaji*
(Radiology Department, Paramedical Faculty, Tabriz University of Medical Sciences) < gharehaghaji@gmail.com>

Behnam Hoseinpour
(Department of Radiology, Faculty of Paramedicine, Tabriz University of Medical Sciences) < behnamhoseinpour78@gmail.com>

Fatemeh Ahmadzadeh
(Department of Radiology, Faculty of Paramedicine, Tabriz University of Medical Sciences) < fatemehahmadzadehgolsefid@gmail.com>

Fatemeh Zarean
(Department of Radiology, Faculty of Paramedicine, Tabriz University of Medical Sciences) < zarean.fatemeh@yahoo.com>

Fatemeh Bakhtiari-asl
(tabriz university of medical sience) < fatemehbaxtiari@gmail.com>

Abstract

Background:

Introduction: Brain cancer is a type of cancer with difficult treatment and low survival rate. Delivery of the therapeutic agents to the brain is difficult due to existence of blood-brain barrier (BBB). Recently, nanotechnology developments have provided the possibility of using nanostructures for both diagnostic and therapeutic purposes in one nanoplatform, named as nanotheranostic. The nanotheranostics can overcome the BBB because of their small size. The aim of the current study was to review the nanotheranostics in brain cancer.

Materials and methods: The related articles to the nanotheranostics in brain cancer were searched from PubMed, Science Direct and Google Scholar using keywords of nanotheranostics, brain cancer, diagnosis and therapy. In total, 20 articles were found and nine of them were reviewed.

Results: The imaging modalities used for early detection of brain tumors by nanotheranostics consist of optical imaging and magnetic resonance imaging (MRI). For optical imaging, different types of the nanostructures including upconversion nanoparticles, quantum dots, carbon nanotubes and Au nanoparticles have been investigated. Among these nanostructures, quantum dots and upconversion nanoparticles showed high safety for the clinical applications. For MRI, iron oxide nanoparticles have been widely used as magnetic portion of the nanotheranostics. Surface modification of the nanostructures with tumor targeting moieties and chemotherapy drugs can be lead to the nanotheranostic agents which can be delivered through the BBB.

Conclusion: Nanotheranostics can provide early detection of brain cancer, and deliver therapeutic agents to the tumor site to destroy cancer cells.

Keywords: Nanotheranostics, Brain cancer, Diagnosis, Therapy

Paper ID: 56

Application of artificial intelligence empowered in the fight against COVID-19

Alireza Akaf*
(Hormozgan University of medical sciences) < arsalanakaf78@gmail.com>

Reza Afzalipour
(Hormozgan University of Medical Sciences) < reza.afzalipour@hums.ac.ir>

Omolbanin Delashoub
(Hormozgan University of Medical Sciences) < odelashoub21@gmail.com>

Abstract

Background:

Background: With the outbreak of COVID-19 worldwide, medical imaging including computed tomography (CT) scan, has played an important role in diagnosing the virus. For this reason, the study has investigated the application of newly emerging artificial intelligence (AI), which has made it possible to strengthen imaging devices and assist the medical staff in the field of diagnosis. The purpose of writing this article is to review the applications of the mentioned technology and answer how to provide contactless workflow in imaging.
Methods: The data of this review study are obtained from articles indexed in valid databases. This research has analyzed the articles related to AI empowered, which have been published recent years.
Results: AI-empowered, in addition to the automatic scanning capability, has changed the shape of workflow so that provides minimal contact between technologist and patient; in addition, it accelerates clinical decisions in the field of diagnosis, tracking and prognosis; therefore, it plays an important role in the fight against COVID-19. Install the camera in CT room in order to receive patient data such as identifying the patient's position and shape, use separate entrance for patient and technologist and the use of ISO center scanners, including AI solutions to quickly detect and prevent cross-infection have been.
Conclusion: The results showed that AI can estimate scan range and by providing automatic workflow, improves scanning efficiency effectively and reduces unnecessary radiation exposure. Also, with the AI, it is possible to perform more than 300 scan per day.
Keywords: Artificial intelligence, COVID-19, Workflow, Diagnosis

Paper ID: 57

Investigation of imaging methods for diagnosis and evaluation of breast tissue abnormalities

Zahra Gharechay*
(Hormozgan University of Medical Sciences) < Gildaagh@gmail.com>

Forough Khaje
(Hormozgan University of Medical Sciences) < Forough.khaje@yahoo.com>

Mahboobeh Ghasemi
(Hormozgan University of Medical) < mah.gsm228@gmail.com>

Reza Afzalipour
(Hormozgan University of Medical Sciences) < reza.afzalipour@hums.ac.ir>

Omolbanin Delashoub
(Hormozgan University of Medical Sciences) < odelashoub21@gmail.com>

Abstract

Background:

Objective: Nowadays studying breast tissue abnormalities has been considered. Breast cancer is one of these abnormalities and is one of the most common cancers among women that causes a large number of them to die annually. Mammography is the most common method in diagnosing breast tissue abnormalities and in addition to the advantages, there are limitations and that's why other imaging methods like tomosynthesis, elastography, sonography are used. The objective of our article is to compare these 3 methods to mammography and investigate their advantages and limitations.
Subjects and methods: Data in this review article is obtained from valid websites and in this study, we used the newest valid articles of breast tissue imaging in recent years.
Results: Mammography is a routine method of breast tissue imaging. Duo to its limitations such as using ionizing radiation, increasing patient's dose, or the limitation of its use in pregnancy, we can replace a better method like sonography that doesn't have mentioned limitaions and also in order to evaluate palpable masses, it's possible to locate them exactly with the help of biopsy. Elastography, which is a non-invasive method, can prevent biopsies and this is its superiority over sonography. Even for diagnosing masses in dense tissues, it's superior to mammography. Also, it's able to show the movements of organs and the path of blood vessels in breast tissue, but it can't provide a quantitative assessment. Tomosynthesis is suitable for breasts with dense tissues and has a better image quality in comparison with mammography. But because of the long exposure time, it increases the percentage of artifact and has no ability to detect micro-calcifications compared to mammography.
Conclusion: Results show that the best method for diagnosing calcifications is mammography, and tomosynthesis can be used if there is a macro-calcification, but elastography and sonography are not able to diagnose calcifications. Due to cross-sectional sections, tomosynthesis is better in diagnosing masses and mammography is not an appropriate method due to tissue overlap. Mammography is painful but one does not suffer from pain in tomosynthesis. Sonography is a good way of assessing the overall mass, but it's not suitable for measuring the exact size of the mass, whereas tomosynthesis is a better method for this purpose. In order to diagnose a breast cancer, mammography is the routine method. But for diagnosing and better evaluation of breast tissue, it's better to use other methods,too.
Key words: Mammography, Sonography, Elastography, Tomosynthesis, Diagnosis, Evaluation

Paper ID: 60

The association between occupational exposure to radiation and child gender in Kerman, Iran Abstract

Firoozeh Afzali*
(Medical Sciences kerman) < afzalifirooze313@gmail.com>

Hadis Alimoradi
(medical university) < h.alimoradi96@gmail.com>

Abstract

Background:

The association between occupational exposure to radiation and child gender in Kerman, Iran.
Hadiseh Alimoradi, Firoozeh Afzali,Dr. Hamid Reza Tohidinik
Department of Radiologic Sciences, Faculty of Allied Medicine, Kerman University of Medical Sciences, Kerman, Iran
Background: Studies have indicated environmental exposure have great impacts on gender offspring. In the present study, we aimed to determine how occupational exposure to low-level radiation as accepted levels in radiology departments could change the genders of the children among radiation workers (RW) and compare our results to nursesin comparison with non-exposed nurses.
Material and Method: In this comparative study, a reliable questionnaire was provided and distributed among radiology workers and nurses working in Kerman province hospitals. we asked questions on age, gender, education, working department, family disease history of diseases, number and gender of offspring, years of experience and drug/smoking history were registered and analyzed. A pairedLinear regression was used to assess these factors with sex proportion (No. Male children/No. Total childern).
Result: In this cross sectional study,Totally, 268 workers including 100 nurses (38±4.8 years of age) and 168 RW (41±8.5 years of age) were enrolled. Mean sex proportion was 0.5155 (Radiologists: 0.49±0.40 Nurses: 56±0.39) (p=0.15). Sex proportion was not significantly different between the two work groups (.....vs.....). None of the studied variables were related to sex proportion.
Conclusions: In this study, we found that, there is no significant difference between nurses and radiation workers in regard with gender and number of offspring. This study has some limitations including lack pf dose assessment and other important factors.
Keywords:
Radiation, Radiation workers, Offspring, Gender, Number of offspring, Nurses

Paper ID: 61

Application of artificial intelligence in breast cancer

Fahimeh Morovati*
(Hormozgan univercity of medical sciences) < Fahimeh4627@gmail.com>

Reza Afzalipour
(Hormozgan University of Medical Sciences) < reza.afzalipour@hums.ac.ir>

Omolbanin Delashoub
(Hormozgan University of Medical Sciences) < odelashoub21@gmail.com>

Abstract

Background:

Outline and purpose: spread of science in the field of medical and complexity of decisions related to diagnosis and treatment has caught the attention of experts to use the decision support systems in medical affairs. Today study on breast abnormalities specially breast cancer that is one of the most common cancers among the females and has the lot of deaths every year, has been taken into consideration. The purpose of this investigation is introducing a new software for early symptoms of breast cancer that diagnose it much faster than usual imaging methods.
Analysis methods : this article's information basically have gotten from reliable databases that have been able to check out the newest reliable articles about the new software for early diagnosis of breast cancer in recent years.
Findings : the AL google software in comparison with radiologists shows better sensitivity in diagnosing cancer or mass(90% vs 78%) and Asymmetry (90% vs 50%) and report's lower positive pseudo cases. The AL is also so practical in diagnosing the T1 cancer which is classified as the invasive cancer in early stages, according to studies, AL easily diagnoses the 91% of T1 cancers and 78% of lymph node cancers while diagnosis of this two cancer by radiologists is 74% for both diseases. Although nowadays mammography devices are the best tool for diagnosing breast cancer but according to investigations they can't be counted as the proper tool for screening; because the doctors may not be able to diagnose the cancerous tumors in some cases correctly by these devices due to breast tissue density and increase the positive and negative pseudo cases.
Conclusion : interpretation of breast cancers symptoms could be the synthesis of art and science. Only an experienced radiologist can take a look at the collection of black and white mammograms and distinguishes the cancerous masses from Accumulation of healthy tissues however, even an experienced eye can make a mistake. Although the artificial intelligence may not be able to be replaced by a human specialist and it doesn't have the desired function but helps to achieve the purpose easier and it can be used as the The second eye of radiologists and use it to guide the early interpretation of breast scan.
Keywords: artificial intelligence, AL Google, breast cancer, radiologist

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Commercialize and increase the security of people using optical sensors used in flatpanel

Afshin Nouri*
(Hormozgan University of Medical Sciences) < Afshinnri@gmail.com>

Reza Afzalipour
(Hormozgan University of Medical Sciences) < reza.afzalipour@hums.ac.ir>

Omolbanin Delashoub
(Hormozgan University of Medical Sciences) < odelashoub21@gmail.com>

Abstract

Background:

Objective: Outline and purpose:Medical imaging has the largest share in receiving artificial Rays. As well as being an indicator of genetical diginities in both the patients and the staff. Therefore researchers a a new technology is made by researcher based on ALARA principles which enhance people's safety and progress image quality by implementing a lower amount of dose . The purpose of this research in investigating the most uptodate optical sensors in flat panels which are capable in preserving one's safety and commercialization.

Subjects and methods: this article's data basically have gotten from valid data bases which have been able to check out recent creditable essays about new optical sensors in FPD .

Results: CMOS technology is based on atomic structure of silicon crystals. Low construction cost and setting analog and digital orbits in the chips generally lowers the expenses that are spent in packaging the CMOStechnology besides improving the density points and bit depth of images without any price increase .X ray photons make a lower noise according to their lower speed in this technology in comparison to aSi. Based on studies the least dark current in commercialized technologies which increases the signal to noise ratio, is regarding to optical layers of stabilized amorphous selenium (a_se)that leads to triple reduction in dark current because of an existence of an insulator layer between the positive electrode an a_se layers.The other technology is the construction of high atomic number polycrystals such as Hgi2 and pbO to create an appropriate quantum efficiency in high energy ranges.

Conclusion: results indicate that CMOS TECHNOLOGY is more qualified in zoom in and HR with better reading speed in comparison to aSi .Also Makes it possible for the frame rate to present better image quality in smaller FOVs and cause of having smaller pixels generates lower dark current and more sensitivity. We expect lower dose,better clarification and an sanitation in quality in case of using the sensors in imaging systems mentioned above . Besides CMOS technology and stabilized selenium (a_se)this research suggests that using polycrystal structures such as Hgi2 and pbO,in addition to resolving the dark current issue and commercialization capability,making it possible to observe the smallest anatomical structures especially in magnification.

Key words: flat panel،silicon technology ،digital imaging device ،radiation exposure

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Using Artificial Intelligence in medical imaging and the role it plays in diagnosis of COVID-19

Zahra Mohammadkhani*
(Hormozgan University of Medical Sciences) < meridamohammadkhani.2882@gmail.com>

Nafiseh Ashkali
(Hormozgan University of Medical Sciences) < nafisehashkali1377@gmail.com>

Fatemeh Riasatifar
(Hormozgan University of Medical Sciences) < Riasatielham@gmail.com>

Reza Afzalipour
(Hormozgan University of Medical Sciences) < reza.afzalipour@hums.ac.ir>

Omolbanin Delashoub
(Hormozgan University of Medical Sciences) < odelashoub21@gmail.com>

Abstract

Background:

Background: Today, we are witnessing the increasing use of artificial intelligence in medical imaging to facilitate diagnosis and treatment, and also to decrease human errors and increase the accuracy and quality of images.On the other hand, the prevalence of COVID-19 virus, medical imaging has played an important role in the diagnosis of this virus; so, in addition to examining the recent advances in artificial intelligence in medical imaging, the study also uses artificial intelligence technology in the diagnosis of COVID-19 virus, which has provided the possibility of strengthening imaging devices and assisting treatment staff in the field of diagnosis.Methods: The data of this article is a review of valid databases and has been able to review the latest authentic articles in recent years regarding artificial intelligence used in imaging centers as well as artificial intelligence in detection of COVID-19 virus.Findings: One of the introduced technologies is Grad-CAM, which by creating thermal maps on the original image, can provide a heat map of the affected areas for people suffering from complications such as lung cancer, various types of pneumonia, especially Covid-19 pneumonia. Another technology is FcoNet, which is a simple 2D learning framework based on a chest CT image that has four methods that can be effective in diagnosing non-pneumonic diseases and pneumonias such as COVID-19, with a minimum accuracy of 87% and maximum of 97%, which can be realized with its high accuracy in diagnosis. It has also reduced the imaging time to ten seconds, which is itself a factor in reducing patients' dose and accelerates making clinical decisions for diagnosis. Other technologies that are only targeted at COVID-19 in this study include CheXpert technology, a model for interpretation of lung radiographic images that can accurately detect pneumonias, another model is based on ResNet for detecting of COVID-19 in x-ray images, which is very useful and has significant accuracy in detection. This study also introduced other technologies related to the evaluation and detection of COVID19, including UNet, D2CNN, and V-Net.Conclusion: In the 21st century, artificial intelligence works as virtual colleagues with technologists and radiologists, but it should be noted that in the field of its effective use, advanced training and fundamental changes are needed. The results show that artificial intelligence can significantly help automate the scanning process and enable safer and more accurate imaging solutions.Also, the use of artificial intelligence in the Crohn's crisis will increase productivity, reduce patient treatment time, reduce patient stay in hospital and optimize staff performance And because the features of COVID-19 imaging are similar to those of other pneumonias, artificial intelligence plays an important role in differentiating between them and being properly diagnosed by radiologists.Keywords: Artificial Intelligence, Medical Imaging, COVID-19

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Comparing accuracy of semantic and radiomics features in prognosis of epidermal growth factor receptor mutation in non-small cell lung cancer

Mahya Naghipoor Alamdari*****
(Tabriz University of Medical sciences) < naghipoor1997@gmail.com>

Nahideh Gharehaghaji
(Radiology Department, Paramedical Faculty, Tabriz University of Medical Sciences) < gharehaghaji@gmail.com>

Abstract

Background:

Purpose: Non-small cell lung cancer (NSCLC) is the most common lung cancer type.Epidermal growth factor receptor (EGFR) mutation is the main reason which causes NSCLC. Computed tomography (CT) is used for diagnosis and prognosis of lung cancers because of low price and little invasion. Semantic analyses of qualitative CT features are based on visual evaluation by radiologist. However, the naked eye ability may not assess all image features.
On the other hand, radiomics provides the opportunity of quantitative analyses for CT images features. The aim of this review study was comparing accuracy of semantic and radiomics features in prognosis of EGFR mutation in NSCLC.
Methods: For this purpose, the keywords including: non-small cell lung cancer, epidermal growth factor receptor mutation, semantic, radiomics, feature, receiver operating characteristics curve (ROC) and area under curve (AUC) were searched in PubMed and Google Scholar. Totally 29 papers were reviewed and the AUC of ROC analyses for semantic and radiomics features were compared.
Results: The results showed that the reported AUC amounts for semantic features (ground glass opacity, shape, margins, lesion density and presence or absence of air bronchogram, emphysema and pleural effusion) were %41-%79. For radiomics features (kurtosis,skewness, entropy, texture, standard deviation (SD) and wavelet) the AUC values were found %50-%86.
Conclusions: In conclusion, the accuracy of radiomics analysis is a little higher than semantic in prognosis of EGFR mutation in NSCLC.
keywords: radiomics,ct, EGFR mutation,NSCLC

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Radiation protection principles in radiology centers in Kermanshah province 2019

Fatemeh Amiri*
(Kermanshah University of medical science) < fatemehamiri22@yahoo.com>

Mohammadrasool Tohidnia
(Kermanshah University of medical sciences) < mtohidnia@yahoo.com>

Hanieh Khateri
(kermanshah university medical student) < hany137676@gmail.com>

Hosna Mansouri
(Kermanshah University of medical sciences) < hosnamohseni75@gmail.com>

Maryam Mirzaei
(Kermanshah University of Medical Sciences) < mirzaei.m.epid92@GMAIL.COM>

Abstract

Background:

Background and purpose: More than 80% of patients require the radiography in their diagnostic and treatment process. The role of radiographers in exposing to patient, staff and patient companion is so important because of the serious risks of ionizing radiation to persons and even their next generation. This research was done in order to evaluate of radiation protection principles in radiology departments in Kermanshah province 2019.

Material and methods: In this descriptive cross-sectional study, 116 radiographers was evaluated by observing the principles of radiation protection. We used a checklist that containing 34 radiation protection principles. Its validity and reliability was confirmed.

Results: Results indicate that only 45 (39.2%) of radiographers did principles of radiation protection desirably. The most and the least subjects that radiographers had respected were radiation protection of themselves (60.8%) and about patient companion (6.3%).

Conclusion: To this survey, radiation protection principles are not designed performed, controlled and monitored sufficiently. It seems to be necessary to holding retraining course. And less than half of radiographers follow all protective measures desirable. It can also be helpful to have a registry system of radiation information.

Keywords: Radiation protection principles, Radiographer, Kermanshah

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Increased efficiency of radiotherapy in combined with gold nanoparticle and NVP-AUY922 in gastric cancer cells

Mahshid Mohammadian*
(Urmia University of medical sciences) < biochem426@gmail.com>

Abstract

Background:

Introduction: gastric cancer is one of the widespread malignancies which encountered with drug resistance. In order to overcome drug resistance nanotechnology including metal nanoparticles could be applied to increases the radiation effect. Among diverse treatment ranges, novel treatments that targets the cancer cells has suggested as considerable effective treatment in cancer. Subsequently, heat shock protein 90 (Hsp90) inhibitor drugs including NVP-AUY922 are presented as active anticancer drug. The objective was to assess the efficiency of combination of the radiation, gold Nano-particle(GNP) and NVP-AUY 922 in gastric cancer cell line to study the possible cytotoxic mechanisms.
Methods: Gastric cancer cell line was treated with different concentrations of NVP-AUY922 and GNP to plotting dose response curves. The radiation dose selected as 2 Gy in all treatment cases. Also, for all treatment cases the minimum cytotoxic concentration for GNP was used. We examined the cellular viability pattern by MTT assay to plotting the dose-response curves. In following the combination efficiency were investigated in concentrations of IC25, and IC10 of NVP-AUY922. the mentioned concentrations were chosen for Real-time PCR [vascular endothelial growth factor].
Results: based on our data, a dose-dependent inhibitory effects were detected in NVP-AUY922 and GNP single treatments. Based on cell viability assay results of triple and double combinatorial cases, GNP increased the cytotoxic effects of radiotherapy and chemotherapy and also down regulate VEGF gene expression.
Conclusions: Our data displayed an efficiency of radiation, GNP and NVP-AUY922 in combined cases on Gastric cancer cell line. Further studies should be performed to confirm the efficacy of these combinations in clinic.