Abstracts and Posters of

The 8th International Clinical Oncology Congress

The 18th Iranian Annual Clinical Oncology Congress

Endorsed by ESTRO

ISRO Iranian Society of Radiation Oncology

ISCO-ESMO Joint Session ESMO

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2	Deep-Learned Classification of Bone Lesions in Proximal Femur/Pelvis X-ray Radiographs	Elaheh Tarighati	Medical Physicists	2	Jan-24	14.00-14.10
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4	Iron oxide nanoparticles coated with polydopamine as a potential nano-photothermal agent for treatment of melanoma cancer	Fahimeh Hossein Beigi	Medical Physicists	4	Jan-24	14.00-14.10
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12	Design and development of 166Dy/166Ho generator to produce carrier-free 166Ho for use in nuclear medicine	Sara Vosoughi	Medical Physicists	2	Jan-24	14.20-14.30
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76	Analysis and effectiveness of music therapy on stress, anxiety, and depression in cancer patients at Vasei Hospital in 1401	Saba Ordibeheshti	Radiobiology	2	Jan-24	14.30-14.40
77	A Randomized, Controlled, Parallel-Group, Trial on the Long-term Effects of Melatonin on Fatigue Associated With Breast Cancer and Its Adjuvant Treatments	Fateme Sheida	Oncology	3	Jan-24	14.30-14.40
78	Recent insight into the adaptive response effect induced by the stimulation of DNA double-strand break repair	Sonia Farhadi	Radiobiology	3	Jan-24	10.40-10.50 AM
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80	Evaluating the relationship between erectile dysfunction and dose received by the penile bulb during definitive radiotherapy of low-risk prostate cancer; A prospective cross-sectional study	Masoumeh Nouri	Oncology	1	Jan-24	14.40-14.50

Dosimetric impact of collimator rotation on volumetric modulated arc therapy and intensity modulated radiotherapy for rectal cancer patients

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Introduction:

Intensity Modulated Radiotherapy (IMRT) and Volumetric Modulated Arc Therapy (VMAT) are primary techniques for rectal cancer treatment. In radiotherapy planning, collimator rotation is a crucial parameter, and its adjustments can lead to dosimetric variations. This study examined the influence of collimator rotation on dosimetric outcomes for different IMRT and VMAT plans for rectal cancer.

Material & Methods:

CT images from 20 male rectal cancer patients were used for IMRT and VMAT treatment planning with varying collimator angles. Nine IMRT techniques (5, 7, and 9 coplanar fields with collimator angles of 0°, 45°, and 90°) and six VMAT techniques (1 and 2 full coplanar arcs with collimator angles of 0°, 45°, and 90°) were planned for each patient. Dosimetric results for target tissue (conformity index [CI] and homogeneity index [HI]) and sparing of organs at risk (OARs) (parameters from OARs dose-volume histograms [DVH]) were analyzed and compared, along with radiobiological findings.

Results:

The 7-fields IMRT technique showed lower bladder doses (V40Gy, V45Gy) unaffected by collimator rotation. The 9-fields IMRT and 2-arcs VMAT (excluding the 90-degree collimator) exhibited the lowest V35Gy and V45Gy. A 90-degree collimator rotation in 2-arcs VMAT significantly increased small bowel and bladder V45Gy, femoral head doses, and HI values. Radiobiologically, the 90-degree rotation adversely affected small bowel NTCP (normal tissue complication probability). No superiority was observed for a 45-degree collimator rotation over 0 or 30 degrees in VMAT techniques.

Conclusion:

Collimator rotation minimally impacted dosimetric parameters in IMRT planning but significantly affected VMAT techniques. A 90-degree rotation in VMAT, especially in a 2-full arc technique, negatively impacted PTV homogeneity index, bladder dose, and small bowel NTCP. Other evaluated collimator angles did not significantly affect VMAT dosimetrical or radiobiological outcomes.

Keywords: Rectal cancer, Intensity-modulated radiotherapy, Volumetric modulated arc therapy, Collimator, Radiobiologic parameters, Dosimetric parameters

Hippocampus Sparing in Whole Brain Radiotherapy: Dosimetric Study Between 3D-conformal, IMRT and VMAT

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Introduction:

Whole Brain Radiotherapy (WBRT) is one of the methods used alone or in combination with other treatments for adults with multiple brain metastases. In WBRT receiving dose by organs at risk (OARs) as well as hippocampus is inevitable. Sparing of OARs such as cochleaes, parotid glands, orbits, lenses, ear canals, scalp can cause to reduction of toxicities for patients treated with WBRT.it is evident that radiation damage to hippocampus can cause to neurocognitive deficits, so it is recommended that the hippocampus in WBRT be considered as an OAR. The aim of this study is comparison dosimetrically between 3Dconformal, intensity-modulated radiotherapy (IMRT) and volumetric-modulated arc therapy (VMAT) in good coverage of planning target volume (PTV) and sparing of organs at risk (OARs) and hippocampus.

Method:

Ten patients previously treated with 3D-conformal WBRT with Elektra Versa_HD linac by using parallel opposed lateral beams were retrospectively re-planned using IMRT (seven beams) and VMAT (two arcs) techniques with OARs and hippocampal sparing. Prescription dose was 30Gy in 10 fractions for all patients. For each technique Dose–volume histogram (DVH), conformity index (CI) and homogeneity index (HI) of PTV, hippocampus D100% and mean and maximum dose and other OARs were calculated and compared.

Results:

As expected the hippocampus is not spared in 3d_ conformal radiotherapy. According to the RTOG 0933 protocol the constraints were used for hippocampi sparing in IMRT and VMAT plans including mean and maximum dose and the dose to hippocampi of 100% of the volume (D100% 9Gy). The mean dose of the hippocampus was 14.3 ± 0.4 Gy and 15.6 ± 0.6 Gy in VMAT and IMRT respectively. The maximum hippocampus dose was 15.2 ± 0.5 Gy and 17.1 ± 0.4 Gy in VMAT and IMRT respectively. The D100% of the hippocampus was 8.45 ± 0.3 Gy and 8.81 ± 0.4 Gy in VMAT and IMRT respectively

Conclusion:

VMAT resulted in the lowest maximum, mean and D100% values for the hippocampus and in overall showed the best PTV coverage and sparing of OARs in WBRT. Hippocampus sparing with VMAT can cause reduction in cognitive decline.

Keywords: Hippocampus Sparing, Whole Brain Radiotherapy, 3D-Conformal, IMRT, VMAT

Beam quality and the mystery behind the lower percentage depth dose in grid therapy

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Introduction:

Grid therapy recently has been picking momentum due to favorable outcomes in bulky tumors. This is being termed as Spatially Fractionated Radiation Therapy (SFRT) and lattice therapy. SFRT can be performed with specially designed blocks made with brass or cerrobend with repeated holes or using multi-leaf collimators. Aim: The main challenge is the mystery behind the lower PDD (percentage depth dose) in grid fields. The knowledge about the beam quality, indexed by TPR20/10 (Tissue Phantom Ratio), is also necessary for absolute dosimetry of grid fields. Since the grid may change the quality of the primary photons, a new k_(q,q_0) should be requested for absolute dosimetry of grid fields. The present Monte Carlo (MC) study was devoted to resolving the questions.

Method:

In this study, the main components of a typical medical linac in 6 MV mode were considered to be simulated using MCNPX® code. Additionally, a commercial grid therapy device was used to simulate the grid fields. After validation of the MC model, output factor, depth of maximum dose, PDDs, dose profiles, TPR20/10, electron and photon spectra were compared between open and grid fields.

Results:

The results demonstrated that output factors for grid fields are 0.2±0.05 lower than in open fields. The dmax is the same for open and grid fields. The difference in TPR20/10 of open and grid fields is observable (~5%).

Conclusion:

TPR20/10 is still a good index for the beam quality in grid fields and consequently choose the correct k_(q,q_0) in measurements. The lower depth dose (~10%) in grid therapy is due to lower depth fluence with scatter radiation but it does not impact the dosimetry as the calibration parameters are insensitive to the effective beam energies. Standard dosimetry in open beam based on international protocol could be used.

Keywords: Grid therapy, Small field dosimetry, Spectrometry, Monte Carlo, Linac

Comparison of Computed Tomography and Magnetic Resonance Imaging in cervical cancer brachytherapy with dosimetric and clinical parameters

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1. Department of Radiotherapy, Faculty of Medicine, Ahvaz Jundishapur University of Medical ScienceIntroduction

Introduction:

The aim of this study was to evaluate the relative deviation of dose-volume(DVH) parameters for the high-risk clinical target volume(HRCTV) and organ at risk (OARs) using computed tomography (CT) versus magnetic resonance imaging (MRI) in cervical cancer brachytherapy.

Method:

In this study, we analyzed 24 patients with pathologically confirmed cervical carcinoma using CT and MR images. The HRCTV and OARs, including the rectum, bladder and sigmoid, were outlined on both images. We calculated the dice coefficient of similarity (DSC) score, and the volume, height, width, and dose parameters including D90, D98, D100 for HRCTV, and dose-volume parameters of OARs including D0.1cc, D1cc, and D2cc. Additionally, we examined the relationship between body mass index (BMI) and the dose parameters.

Results:

There was strong correlation between CT and MR images for the bladder (r>=0,72) and rectum (r>=0.83) except for the D0.1cc of the bladder. However, there was a poor correlation between the doses of HRCTV for CT and MRI plans for DVH parameters such as D90,D98, and D100.The mean DSC range was between 75.13% for the bladder, 64.13% for the rectum,56.71% for the sigmoid, and 66.54% for HRCTV.

Conclusion:

MRI is currently considered the gold standard for tumor delineation. However, CT with clinical information can also provide comparable results, which merit further investigation. When planning treatment, it may be necessary to consider both MRI and CT in order to make an informed decision.

Keywords: CT, MRI, dose-volume histogram, cervical cancer, brachytherapy

Mirafos®: A combination of natural and chemical antioxidants capable of radiosensitizing tumor cells and radioprotector of normal tissue

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Introduction:

Ionizing radiation used for radiotherapy of cancer pose side effects on normal tissue that intervene in the process of radiotherapy. Short term effects such as leukopenia and thrombocytopenia lead to immunodeficiency. Long term effects such as infertility, secondary cancers and transgenerational genetic diseases are other side effects of radiotherapy. Despite long time efforts toward introducing a chemical or natural radioprotector to combat side effects of radiotherapy, little success was achieved so far. Moreover, radiation oncologists are reluctant to use chemical radioprotectors for cancer patients because they think it might intervene with the effect of ionizing radiation on tumor.

Method:

Mirafos®, an orally administrable drug with patented ingredient is a mixture of chemical and natural antioxidative agents that was tested for genotoxicity and cytotoxicity on various tissue types in vivo and in vitro. The end points used in the preclinical study of this drug were of DNA damage, micronucleus assay, chromosomal aberration assay, MTT and cell survival assay alone or in the form of mixed agents. Results were analyzed with appropriate statistical tests for significances.

Results:

Results of cytome assay, cell survival, MTT assay, DNA damage and micronucleus assay indicated that some ingredients when administered in combination act as a powerful radioprotector on normal tissues and cells, while some of them induce radiosensitivity when using cells with genome instability such as lymphocytes of breast cancer patients. These agents have no protective effect on normal cells against radiation.

Conclusion:

Mirafos®, was found a dual action drug with different ingredients that act as both radioprotector of normal tissue and a radiosensitizer of tumor tissue. When administered, accumulation of Mirafos® lead to higher efficacy of radiation on tumor cells and on the other side protecting the normal tissue from side effects of ionizing radiation. This differential effect may lead to higher therapeutic gain factor. Other important features of Mirafos® are oral administration route, stability in ambient condition, and low cost. It may also lower the risk of secondary cancer due to radiotherapy by protection of normal tissues.

Keywords: Radioprotection, radiosensitizer, genotoxicity, tumor radiotherapy, Mirafos®

Investigating factors related to advanced care planning in the elderly in a cross-sectional study in Iran

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Introduction:

Elderly is a phenomenon in the 21st century in developed and developing countries, which is considered as a silent revolution. Studies show that the end-of-life care needs of elderly patients are not well taken into account, considering that palliative care is done with the aim of improving the quality of life of patients with life-threatening diseases and their families, one of the most important priorities in palliative care includes discussion And the discussion is about patients' desire to receive palliative care and their preferences regarding end-of-life issues, which is called advanced care planning. Therefore, the aim of this study is to investigate the factors related to advanced care planning

Method:

This cross-sectional descriptive study was conducted in 2021-2022 in four hospitals in Tehran and with 390 eligible elderly people using available sampling method. The instrument used was the Persian version of the Advanced Care Planning Questionnaire and related factors It was determined by advanced care planning with multivariate linear regression test.

Results:

The results show that the availability of advanced care planning services, discussions about it with others, patients' attitudes about advanced care planning and disease experience are 35% predictors of patients' feelings towards advanced care planning. There is a significant relationship between demographic variables such as income, marital status, gender and education of patients with advanced care planning

Conclusion:

Considering that the factors related to advanced care planning can be different from one person to another and affected by different conditions, therefore with proper training of the treatment team and the knowledge and attitude that patients can acquire about advanced care planning.it is possible to achieve specialized care at the end of life and respect the dignity of patients.

Keywords: advanced care planning, elderly, end of life care

Patient-specific geometrical distortion corrections of MRI images improve dosimetric planning accuracy of vestibular schwannoma treated with gamma knife stereotactic radiosurgery

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Introduction:

To investigate the impact of MRI patient-specific geometrical distortion (PSD) on the quality of Gamma Knife stereotactic radiosurgery (GK-SRS) plans of the vestibular schwannoma (VS) tumors.

Method:

Three open access datasets including the MPILeipzig Mind-Brain-Body (318 patients), the slow event-related fMRI designs dataset (62 patients), and the VS dataset (242 patients) were used. We used first two datasets to train a 3D convolution network to predict the distortion map of third dataset that were then used to calculate and correct the PSD. GK-SRS plans of VS dataset were used to evaluate dose distribution of PSD-corrected MRI images. GK-SRS prescription dose of VS cases was 12 Gy. Geometric and dosimetric discrepancies were assessed between the dose distributions and contours before and after the PSD corrections. Geometry indices were center of the contours, Dice coefficient (DC), Hausdorff distance (HD), and dosimetric indices were D□, Dmax, Dmin, and D95% doses, target coverage (TC), Paddick's conformity index (PCI), Paddick's gradient index (GI), and homogeneity index (HI).

Results:

Geometric distortions of about 1.2 mm were observed at the air-tissue interfaces at the air canal and nasal cavity borders.Average center of the targets was significantly distorted along the frequency encoding direction after the PSDcorrection. Average DC and HD metrics were 0.90 and 2.13 mm. Average D□, D95%, and Dmin in Gy significantly increased after PSD correction from 16.85 to 17.25, 12.30 to 12.77, and from 8.98 to 9.92. Dmax did not significantly change after the correction. Average TC and PCI significantly increased from 0.97 to 0.98,and 0.94 to 0.96.Average GI decreased significantly from 2.24 to 2.15 after PSD correction. However, HI did not significantly change after the correction.

Conclusion:

The proposed method could predict and correct the PSD that indicates the importance of PSD correction before GK-SRS plans of the VS patients.

Keywords: deep learning, field mapping, image quality, precision radiation therapy, susceptibility variations

Quality of life assessment among older adult patients with chronic wounds

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Introduction:

Patients with chronic wounds experience various biopsychosocial problems which severely affects their quality of life (QOL). Thus, a Persian instrument to assess the QoL of these patients is required. This study aimed to determine the psychometric properties of the Persian version of the wound-QOL questionnaire.

Method:

This methodological study was performed on Iranian patients during 2021-2022. The translation was carried out via forward-backward method. Face validity was addressed with 10 patients and content validity with 12 wound specialists. Construct validity was also assessed by performing exploratory factor analysis (EFA) (n = 100) and convergent validation with EQ-5D-3L plus Pain VAS Score and known-groups validity. The reliability was assessed by internal consistency using Cronbach's alpha coefficient and test-retest.

Results:

A total of 100 patients with chronic wounds were included in the study. Two factors with cumulative variance of 65.39% were extracted during EFA. The results revealed a significant and high correlation between the total scores of wound-QOL questionnaire, the Persian version of EQ-5D-3L ($p = 0.000$, $r = 0.502$), and Pain score (0-10; $p = 0.000$, $r = 0.627$). The Cronbach's alpha was 0.743 and stability of the questionnaire (? = 0.872) was confirmed. In confirming the known-groups validity, the results showed that this tool can differentiate the QOL of patients with different wounds

Conclusion:

The Persian version of the wound-QOL questionnaire is a valid and reliable questionnaire which can measure the QoL of patients with chronic wounds. This instrument can be used in clinical evaluation as well as research purposes across the Iranian population

Keywords: EQ-5D-3L; Iran; Persian; chronic wound; quality of life; reliability; validation; wound-QOL questionnaire.

Dosimetric comparison of 3D Conformal Radiotherapy, IMRT and Tomotherapy plans in Nasopharyngeal Cancer

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Introduction:

Nasopharyngeal Cancer (NPC) is one of the most common head and neck cancers. Approximately 68% of NPC patients suffer from locally advanced disease at the time of diagnosis. The purpose of this study is to compare and evaluate the dosimetric parameters of Three-Dimensional Conformal Radiotherapy (3D-CRT), step-and-shoot Intensity Modulated Radiation Therapy (SaS-IMRT) and Helical Tomotherapy (HT) in advanced NPC to help choose the optimal technique for nasopharyngeal patients.

Method:

A retrospective study was conducted involving 10 patients with advanced NPC who were re-planned using HT, SaS-IMRT and 3D-CRT techniques. All three techniques were optimized to deliver 70 Gy in 33 fractions simultaneously to the primary tumor and metastatic lymph nodes, and 59.4 Gy in 33 fractions to the high-risk regions. The dosimetric parameters of the Planning Target Volumes (PTVs) and Organs at Risks (OARs), along with treatment time, were evaluated and compared using the paired-samples t-test.

Results:

HT significantly possessed better target homogeneity, conformity and better mean dose compared to 3D-CRT and SaS-IMRT. Also, reduced the dose delivered to OARs compared with 3D-CRT. Although in compared with SaS-IMRT and HT, 3D-CRT reduced the treatment delivery time by 51.5% and 44.05% respectively, but worse in tumor coverage and dosimetric accuracy and protection of some OAR compared with SaS-IMRT and HT.

Conclusion:

Despite the HT achieving optimal conformity, homogeneity for PTV coverage, and optimal OARs sparing, shorter treatment times for 3D-CRT reduce the probability of patient movement and discomfort. The findings of this study can offer guidance for selecting suitable radiation technologies for treating patients with advanced NPC.

Keywords: 3D-CRT, Nasopharyngeal Cancer, Helical Tomotherapy, step-and-shoot IMRT.

Exploring the Beam Modeling Algorithm in Patient-Specific IMRT Quality Assurance

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Introduction:

The main objective of this study is to assess the dosimetric accuracy in the delivery of intensity-modulated radiation therapy (IMRT) and its impact on patient-specific quality assurance (QA). Specifically, the focus is on the verification of treatment plans in a phantom geometry, known as pretreatment patient-specific QA, for small fields. Small fields present challenges in accurately modeling their dosimetric characteristics in treatment planning systems (TPS) and transferring them to treatment delivery. This study aims to investigate how imprecise beam modeling of small fields in TPSs affects patient-specific IMRT QA. Two different dose calculation algorithms used in commercial TPSs are evaluated, and the impact of imprecise extrapolation of small field parameters on IMRT QA is studied.

Method:

Experimental measurements were conducted using a Siemens Artiste linear accelerator with different field sizes. The behaviors of two different dose calculation algorithms were analyzed using a 2D diode array, specifically the MapCHECK2 system from Sun Nuclear Corporation. Planar dose comparison between the TPSs and the 2D array was performed for fields involving small segments, and the percentage of points that passed the acceptable gamma criteria was calculated. The gamma criteria used were a 3% dose difference and a 3mm distance-to-agreement (DTA) with a 10% dose threshold

Results:

The study demonstrated that the collapsed cone convolution/superposition algorithm (CCCS) used in the Prowess TPS accurately models the small nonequilibrium IMRT segments compared to the full scatter convolution (FSC) algorithm used in the TiGRT TPS. Gamma analysis of the calculated and measured dose distributions showed that the gamma index pass rate for small segments designed by Prowess was good. However, the results obtained by TiGRT showed a significant difference in average segment size below 3×3 cm2, indicating imprecise beam modeling of small fields by FSC.

Conclusion:

Based on the conducted studies, it can be concluded that there is a direct relationship between the dose calculation algorithm, beam modeling of small fields, and patient-specific QA. The choice of dose calculation algorithm and accurate beam modeling for small fields are crucial factors in ensuring dosimetric accuracy in IMRT treatment delivery.

Keywords: IMRT quality assurance, small IMRT segment, dose calculation algorithm

Evaluation of the relationship between the complexity of Intensity Modulated Radiation Therapy of head and neck plans and results of Quality Assurance with the help of phantom measurements and determination of complexity threshold values

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Introduction:

Intensity-modulated radiation therapy (IMRT) is an effective technique for the treatment of all types of tumors, especially in the head and neck region. Modulation Complexity score (MCS) is a tool for predicting the delivery and accuracy of treatment plans, which are determined in the range of 0-1. The gamma passing criterion is used to evaluate the dose values measured by phantom and the dose calculated by the treatment planning system. Determining the range of the complexity factors in treatment plans can help to predict the results of quality assurance and prevent the creation of complex plans. Thus, the present study aims to investigate head and neck treatment plans with the IMRT technique and to perform quality assurance for each of them to determine the range of acceptable complexity.

Method:

The initial treatment plans of 30 head and neck cancer patients who were treated with IMRT using the Step-and-shoot method by the Ray Station treatment planning system were examined. Then MCS and PMU complexity indicators were coded and added to the treatment planning system. Then three treatment plans; A simple, standard, and complex treatment plan were created for patients. Quality assurance of the plans is done with Octavius 4D phantom, the implementation and the relationship of complexity and quality assurance results were compared with each other using gamma criteria of 3%/3mm

Results:

The results of the study showed that complex treatment plans had lower MCS and higher total MU and PMU than other treatment plans. With the increase of MU and the number of segments, complexity increases. There is a statistically significant relationship between the amount of MCS and PMU with the number of segments (p=0.000). The mean gamma pass rate in all treatment plans was more than 99% and Its values were the highest in simple treatment plans and the lowest in complex treatment plans. A statistically significant relationship was not observed between the gamma pass and complexity parameters.

Conclusion:

MCS is a sensitive metric for distinguishing between complex, standard, and simple treatment plans. This criterion can be incorporated into the process of plan evaluation

Keywords: quality assurance of patient treatment plans, complexity of treatment plans, complexity index, complexity threshold value, IMRT

A multicenter, randomized, open-label, controlled trial to compare recurrence pattern of reduced margins vs RTOG protocol in adjuvant chemoradiation of high grade glioma

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Introduction:

The current standard treatment for high-grade glioma (HGG) Typically includes maximal surgical resection and adjuvant radiotherapy, with or without concurrent chemotherapy, followed by adjuvant chemotherapy. There is still some debate about the target delineation of HGG, and it continues to be a subject of investigation. This study aimed to assess the feasibility, safety, and efficacy of using a smaller margin of radiotherapy than what is recommended in the latest ESTRO/ACROP guideline for HGG.

Method:

In this multicenter, randomized, open-label, controlled trial, patients aged 18 to 75 years with grade 3 and 4 gliomas were enrolled following surgery. Eligible patients were randomly assigned to either the standard group, based on RTOG guidelines, or the intervention group, which utilized a smaller margin of 1 cm. They received a total dose of 60 Gy in two phases according to the RTOG protocol. After chemoradiation, patients underwent brain MRI every three months during follow-up. The recurrence pattern was determined by the 95% isodose line on the CT scan used for treatment planning at the time of imaging progression.

Results:

A total of 258 patients were randomly assigned to two groups. Both groups were similar in terms of age, gender, radiotherapy technique, IDH mutation status, type of surgery, surgery-radiotherapy interval, duration of adjuvant chemotherapy, GTV60 volume, and the volume of GTV46. Grade 4 tumors were more prevalent in the control group (31.3% vs. 18.8%, p=0.02). There was no significant difference in the in-field recurrence rates between the two groups (intervention: 84% vs. control: 83.8%, p = 0.829).

Conclusion:

Adjuvant radiotherapy of HGG with smaller margins does not compromise the recurrence pattern of the tumor. Therefore, it is safe to recommend a smaller margin in order to spare more normal brain tissue.

Keywords: high grade glioma, adjuvant radiotherapy, margin, target delineation

Evaluation of IMRT plan robustness in patients with localized prostate cancer using different setup uncertainty scenarios

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Introduction:

Robustness evaluation is increasingly used in radiotherapy planning to assess the degree of resiliency of the required dose distribution to the radiotherapy uncertainties. This study aimed to assess the impact of systematic setup uncertainty on intensity modulated radiation therapy (IMRT) plans in patients with localized prostate cancer using a plan robustness evaluation method.

Method:

Ten prostate patients previously treated with IMRT were selected for this study. Clinical target volume (CTV) to planned target volume (PTV) margins of 7 mm in all directions, except 4 mm posteriorly, were used. The original plans were normalized to PTV V98%>98%. Seven uncertainty plans were recalculated based on the 5 times setup errors acquired from electronic portal imaging device (EPID) and two worst-case scenarios. CTV, PTV, rectum, bladder, femoral heads, and penile bulb dose metrics were analyzed between the 10 O-plans 70 and U-plans. The dose differences of the O-plans and U-plans corresponded to the plan robustness for each structure.

Results:

The mean dose differences of D2cc, D95%, D98%, V95%, and V100% (ΔD2cc, ΔD95% and ΔD98%, ΔV95% and ΔV100%,) of CTV were respectively 1.3 Gy, 3 Gy, 4.6 Gy, 4.2%, and 9.7%. The mean (SD) of worst-case for CTV V95% and CTV V100% were 97.4% (4.0%) and 90.3% (6.7%). The ΔDmax, ΔD95% , and ΔD98% of PTV were 1.2 Gy, 12.1 Gy, and 17.4 Gy, respectively. CTV exhibited more strong robustness than PTV. In rectum, ΔV60Gy and ΔV70Gy were 20.9% and 15.1%. The mean (SD) of worst-case rectum for V60 and V70 were 24.2% (8.7%) and 16.0% (6.1%). Both ΔV60Gy and ΔV65Gy were 14.6% for bladder. The mean (SD) of worst-case bladder for V60 and V65 were 24.2% (5.4%) and 24.6% (6.3%). ΔD1% and ΔD90% were 6.5 Gy and 20.3 Gy for femoral heads and penile bulb. In OARs, the rectum and penile bulb exhibited weak robustness due to their location.

Conclusion:

IMRT plans had a strong sensitivity to setup uncertainty beyond 4 mm, with increasing risk of underdose of tumor and overdose of OARs. Therefore, IMRT plans for localized prostate patients can be considered robust if setup uncertainties kept at or below 4 mm for prostate patients

Keywords: IMRT, Plan robustness, Prostate cancer, setup uncertainty

Accurate prediction: deep learning approach for dose prediction integrating field shape and patient anatomy in breast cancer patients' radiation therapy

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Introduction:

Geometrical information, particularly field shape, plays a pivotal role in accurate dose calculation for radiation therapy. Recent advancements in dose prediction utilizing deep learning focus predominantly on CT images and patient contouring. This study aims developing a deep learning method that incorporates not only CT and contouring images but also leverages field shape for three-dimensional dose prediction in breast cancer radiotherapy.

Method:

In this study, a dataset comprising 150 breast cancer patients treated with the 3D CRT technique was utilized to train and test a proposed deep learning model. The model incorporated CT images, patients' contouring, and field shape as inputs. The network output was the corresponding the patients' dose distribution. Dosimetric parameters extracted from dose volume histograms for planned and predicted distributions were compared. Parameters included Dmean for the planning target volume and organs at risk, as well as D95%, D50%, V47.5Gy for the planning target volume, and V30Gy, V25Gy for the heart, and V20Gy for the left lung.

Results:

The average absolute difference of the Dmean relative to the prescribed dose for the PTV, heart, left lung, right lung and spinal cord were 1.37%, 2.02%, 2.12%, 0.37% and 0.41%, respectively. The 3D gamma pass rate with 3mm/3% criteria for planning target volume, heart, left lung, right lung, spinal cord and body were 89.49%, 91.39%, 92.84%, 98.71%, 99.46% and 96.29% respectively.

Conclusion:

This study presents promising results indicating no significant differences between predicted and planned dose distributions using a novel deep learning model for 3D dose prediction in breast cancer radiotherapy. The model exhibits rapid real-time prediction capabilities, providing accurate results within seconds. Further studies with more patients and on other cancer sites are essential to fully validate the proposed method.

Keywords: deep learning, dose distribution prediction, field shape, breast cancer

Disease control outcomes of stereotactic body radiation therapy or moderate hypo-fractionation for prostate cancer: Real-world experience at two Canadian centers

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Introduction:

Advantages of using stereotactic body radiation therapy to treat prostate cancer include short treatment times, decreased costs, and limited toxicity. Randomized trial outcomes comparing 5-fraction stereotactic body radiation therapy to conventionally fractionated radiotherapy or hypo-fractionated radiation therapy are pending.

Method:

Patients with low- or intermediate-risk prostate cancer treated with stereotactic body radiation therapy alone (35-40 Gy in 5 fractions) or hypo-fractionated radiation therapy alone (60-62 Gy in 20 fractions) in the period of July 2010 and June 2020. The biochemical relapse-free survival, PSA nadir, interval time to PSA nadir, time to biochemical recurrence (2 ng/ml above PSA nadir) and overall survival were reviewed. Outcomes between treatment groups were compared after propensity-matching by patient baseline characteristics. Kaplan-Meier curves were used to assess biochemical relapse-free survival and overall survival

Results:

We identified 205 and 513 patients with low or intermediate-risk prostate cancer who were treated with stereotactic body radiation therapy or hypo-fractionation, respectively. Intermediate-risk category composed 81% and 95% of the stereotactic body radiation therapy and hypo-fractionated radiation therapy cohorts, respectively. After a median follow up of 58.6 months for the stereotactic body radiation therapy cohort and 45.0 months for the hypo-fractionated cohort, biochemical relapse-free survival and overall survival were not significantly different between treatment groups. The 5-year biochemical relapse-free survival rates were 92.1% and 93.6% and overall survival rates were 96.4% and 95.0% for the stereotactic body radiation therapy and hypo-fractionated cohorts, respectively, after propensity-matching. Stereotactic body radiation therapy resulted in a significantly lower PSA nadir (0.18 ng/ml) compared to hypo-fractionated radiation therapy (0.48 ng/ml) in patients with low-risk prostate cancer. Mean time to biochemical recurrence was not different between treatment groups.

Conclusion:

Stereotactic body radiation therapy is an effective treatment option for low and intermediate-risk prostate cancer with encouraging biochemical relapse-free survival and overall survival rates comparable with hypo-fractionated radiation therapy.

Keywords: PSA nadir; SBRT; biochemical failure; hypofractionated radiotherapy.

Assessment of radiation therapy dose distribution using digitally reconstructed Radiograph

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Introduction:

The DRR has typically been employed for verifying the geometry in radiotherapy treatment, and there have been no documented instances of its use for dosimetric purposes. This research aims to introduce a new methodology, allowing us to generate a two-dimensional dose distribution within a treatment plan using the DRR for the first time.

Method:

First, the study will investigate the relationship between the pixel values of the DRR and water-equivalent thickness (WET). Next, it aims to establish a link between depth and absorbed dose. By combining these relationships, a new equation will be developed to connect the pixel values of the DRR to the absorbed dose. This method will be utilized to calculate the dose distribution in the isocentric plane for both homogeneous and heterogeneous phantoms. To verify the accuracy of this approach, the results will be compared with the two-dimensional dose distribution from the treatment planning system (TPS).

Results:

At the isocenter, the point dose comparison indicates a variance of around 1% for the homogeneous phantom and 1.2% for the heterogeneous phantom. A gamma analysis (3%-3mm criteria) was conducted to compare the region-based dose distribution. The pass rate achieved was 98.44% for the homogeneous phantom and 96.6% for the heterogeneous phantom

Conclusion:

Confirming the dose distribution derived from this method with TPS introduces a novel use of DRR for assessing dose distribution in perpendicular planes to the treatment field's central axis. This serves as a means for verifying treatment planning and a fresh approach to quality control in radiotherapy.

Keywords: Radiotherapy, Digitally Reconstructed Radiograph, Dosimetry verification, Water Equivalent Thickness

Exploration of the Strategies of Iranian Nurses in Providing Palliative Care to Children with Cancer: A Qualitative

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Introduction:

Due to the prevalence of cancer in children and the decrease in their quality of life, attention to palliative care has become one of the main concerns of the Iranian health system. Given that nurses are the key members of pediatric palliative care, explaining their strategies can help to identify existing limitations in addition to recognizing ongoing care. So this study aimed to explain the strategies of Iranian nurses in providing palliative care to children with cancer.

Method:

This study is a qualitative research with an approach to the conventional content analysis. The main participants were nine nurses working in ward pediatric oncology. Also based on data analysis, five parents of children, two children, one social worker, one physician, one psychologist, and one nutritionist were also included. Data were collected through semi-structured interviews and observation and were analyzed by the Elo and Kyngäs approach. Lincoln and Guba criteria were used for the trustworthiness of data analysis.

Results:

Three conceptual categories were developed with qualitative analysis: “prevention and relief of pain and physical symptoms”, “spontaneous compassion”, and “strengthen parental resilience”; that were derived from the main categories: “attention to precautionary considerations,” “friendly relationship of nurses with parents of children, create enjoyable moments, spontaneous assistance,” “facilitate coping with current situation, perceived confrontation with child death.

Conclusion:

In this study, the results showed that nurses’ strategies in providing palliative care to children with cancer were a combination of professional and spontaneous strategies.

Keywords: Children with cancer, Iran, nurses’ strategies, palliative care, qualitative study

Palliative care versus supportive care in cancer: Two alternative or complementary approaches?

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Background:

The concept of palliative care is interpreted with different meanings in societies and references. In other words, in some cases, palliative care is associated with end-of-life and lack of response to treatments, and dying. Hence, it can create a negative impression on the patients, families, and even the health care providers. In fact, palliative care was traditionally provided to the patients that are in advanced or incurable stages. However, it is stated that palliative care should be provided at every stage of illness trajectory along with receiving medical services and treatments. While in recent interpretations, it has been attempted to change the negative connotation of palliative care, it still remains challenging.

Objective:

This study was conducted with the aim of investigating and describing a comprehensive term with a positive impression in the field of supportive/palliative care.

Methods:

Key databases were searched and the relevant medical literature were reviewed.

Results:

In this regard, it has been preferred to change the previous prospective into more positive views in some societies. To this end, the term of “supportive care” is highlighted more than before. Indeed, supportive care is known as a comprehensive term that provided from pre-diagnosis to bereavement. Over the past years, by gaining a comprehensive understanding of supportive care as well as palliative care roles in the process of managing conditions facing by patients and their families, the two terms can be evolved and even intertwined, so that it can be considered “Supportive and palliative care”. In this context, supportive and palliative care referred to specialized interdisciplinary cares that aims to improve the quality of life of patients and their families dealing with the issues associated with severe, progressive, and life threatening/limiting conditions, which includes the management of physical, psychosocial, emotional, and spiritual needs of both patients and their families.

Conclusion:

Therefore, it can be concluded that in the current framework, supportive and palliative care provides to the patients from pre-diagnosis, through treatment, to post-treatment stages, rather than the use of supportive care or palliative care independently.

Key words: Cancer, End-of-life, Oncology, Palliative care, Supportive care.

Development and psychometric properties of Health-Promoting Lifestyle Scale in Colorectal Cancer Survivors (HPLS-CRCS): a mixed-method study

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Introduction:

Detecting a health-promoting lifestyle in colorectal cancer (CRC) survivors is of paramount importance to manage disease complications, prevent their recurrence, and enhance survival; however, no specialized tool has yet been provided to measure the lifestyle of these patients. Accordingly, this study aimed to develop and determine the psychometric properties of the Health-Promoting Lifestyle Scale in CRC Survivors (HPLS-CRCS).

Material & Methods:

This study was a mixed study with an exploratory sequential design in two phases. Concept analysis was performed in the first phase according to Schwartz-Barcott and Kim's (2000) hybrid model to explain the concept, identify dimensions, and generate items. In the second phase, psychometrics including validity (face, content, and construct) and reliability (internal consistency and stability) were determined. Responsiveness, interpretability, ease of use, item weighting, and scale scoring were also determined.

Results:

After explaining the concept, an initial scale encompassing 211 items was developed, content and item analyses were conducted, and the items decreased to 89 items after the face validity assessment. For construct validity, confirmatory factor analysis (CFA) was conducted with a sample size of 500 survivors, and convergent validity was performed for the Persian version of the Health-Promoting Lifestyle Profile II (HPLP-II). Accordingly, 80 items were classified into six factors: activity and rest, spiritual growth, health responsibility, nutrition, interpersonal relationships, and psychological management, with RMSEA = 0.055, $\chi 2/df = 2.484$, and $\chi 2 = 6816.516$. The reliability of the scale was confirmed, Cronbach's alpha was between 0.865 and 0.928, and the intraclass correlation coefficient (ICC), the standard error of measurement (SEM), the minimal important change (MIC), and the smallest detectable change (SDC) were 0.896, 3.36, 13.86, and 19.87, respectively.

Conclusion:

The HPLS-CRCS consists of 80 items in six dimensions and is a valid and reliable scale for evaluating the health-promoting lifestyle in CRC survivors. Using this scale to evaluate the healthy lifestyle of these survivors can lead healthcare providers to detect deficiencies and plan the lifestyle of CRC survivors during the post-treatment period.

Keywords: Lifestyle, Health promotion, Colorectal cancer, Survivors, Scale, Psychometrics

Good Death from the perspective of family-members of cancer patients in Iran

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Achieving good death and enhancement of end-of-life care are among the objectives of palliative care in patients with cancer. There should be an instrument for evaluating the quality of palliative care provided by family members to provide comprehensive care at the end of life. This study was done for translation and assessment the psychometric properties of good death inventory- short form according to the perspective of family of patients with cancer in Tehran. Overall, 204 family members of patients with cancer were included. In the exploratory factor analysis, three factors of peace, hope, and value as well as quality of care were extracted with cumulative variance of 41.8%. We found a significant and suitable correlation between the total scores of the participants Good death inventory-short form and care evaluation scale2.0 ($r = 0.459$, $P < 0.001$). Also, there was a positive and significant correlation between the GDI short form total score and general satisfaction with end-of-life care ($r=0.423$, $p<0.001$) as well as the patient's general quality of life at terminal stages ($r=0.539$, $p<0.001$). The Cronbach's alpha coefficient for the questionnaire was found 0.842, and the stability was confirmed with ICC=0.851. The Persian version of GDI-short form is a valid and reliable questionnaire which can investigate the factors associated with good death according to patients' family members' perspective. Thus, this instrument can be used in clinical evaluation as well as research purposes and for family members in Iranian population.

Keywords: Palliative Care, End-Of-Life Care, Questionnaires, Good Death, Cancer, Validation, quality of dying and death, hospice

A case of Lymphoma with a Large Chest Wound

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Introduction:

This case report presents a clinical case of lymphoma with a large ulcer in the chest. The diagnosis was confirmed through biopsy and pathology, revealing High Grade B cell Lymphoma.

Methods:

Descriptive methods were used to document the clinical manifestations of the patient upon arrival. These included a very large wound on the chest wall, severe edema of the hands, increased creatinine levels during hospitalization, pleural effusion in chest radiograph, and pulmonary involvement in lung CT. The patient underwent chemotherapy, and after one week, was discharged with a good general condition and reduced wound size.

Results:

Following chemotherapy, the patient showed significant improvement in the general condition and a reduction in the size of the wound.

Conclusion:

This case highlights the importance of scientific and professional nursing care in achieving effective results in the management of lymphoma wounds.

Keywords: lymphoma, wound, nursing care