LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : JURNAL ILMIAH

Judul Karya Ilmiah (Artikel)	:	The effective and water-equivalent diameters as geometrical size functions for estimating CT dose in the thoracic, abdominal, and pelvic regions		
Jumlah Penulis	:	5 Orang		
Status Pengusul	:	~~Penulis pertama~~/ Penulis ke 2/ Penulis Korespondesi **		
Identitas Jurnal Ilmiah	:	a. Nama Jurnal	:	Polish Journal of Medical Physics and Engineering
		b. Nomor ISSN	:	1898-0309
		c. Volume, Nomor, Bulan, Tahun	:	Vol. 27 No. 3, September 2021
		d. Penerbit	:	Polish Society of Medical Physics
		e. DOI artikel (jika ada)	:	10.2478/pjmpe-2021-0026
		f. Alamat web jurnal	:	https://sciendo.com/journal/PJMPE
		g. Terindeks di Scimagojr/Scopus ~~atau di….**~~		

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- [ ] Jurnal Ilmiah Nasional Terakreditasi
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b. Ruang lingkup dan kedalaman pembahasan (30%)	11,8	11,1	11,45
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	11,8	10,6	11,2
d. Kelengkapan unsur dan kualitas penerbit (30%)	11,6	11,6	11,6
Total = (100%)	**39**	**37,0**	**38**
Nilai untuk Pengusul : (40% x 38) = 15,2			

Semarang, 1 Desember 2021

Reviewer 1

Prof. Dr. Drs. Muhammad Nur, DEA
NIP. 195711261990011001
Bidang ilmu/Unit kerja : Fisika/Fakultas Sains dan Matematika

Reviewer 2

Dr. Drs. Catur Edi Widodo, M.T.
NIP. 196405181992031002
Bidang ilmu/Unit kerja : Fisika/Fakultas Sains dan Matematika

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HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : JURNAL ILMIAH

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		Alamat Artikel	:	https://sciendo.com/article/10.2478/pjmpe-2021-0026
		g. Terindex	:	Scopus

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c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	12			11,8
d. Kelengkapan unsur dan kualitas terbitan/jurnal (30%)	12			11,6
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Nilai Pengusul = 40% x 39 = 15,60				

Catatan Penilaian artikel oleh Reviewer :

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3. **Kecukupan dan kemutakhiran data/informasi dan metodologi:**
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4. **Kelengkapan unsur dan kualitas terbitan:**
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Semarang, 29 Desember 2021
Reviewer 1

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Bidang Ilmu: Fakultas Sains dan Matematika

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Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Jurnal Ilmiah			Nilai Akhir Yang Diperoleh
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b. Ruang lingkup dan kedalaman pembahasan (30%)	12			11,1
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	12			10,6
d. Kelengkapan unsur dan kualitas terbitan/jurnal (30%)	12			11,6
Total = (100%)	**40**			**37,0**
Nilai Pengusul = 40% x 37,0 = 14,8				

Catatan Penilaian artikel oleh Reviewer :

1. **<u>Kesesuaian dan kelengkapan unsur isi jurnal:</u>**

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2. **<u>Ruang lingkup dan kedalaman pembahasan:</u>**

Substansi artikel yaitu tentang estimasi dosis daerah thorak, abdomen dan plevic pada pemeriksaan CT Scan telah sesuai dengan ruang lingkup jurnal, dengan kedalaman pembahasan sangat baik

3. **<u>Kecukupan dan kemutakhiran data/informasi dan metodologi:</u>**

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penelitian

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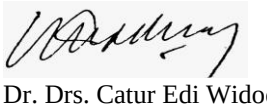
Semarang, 23 Nopember 2021
Reviewer 2



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The effective and water-equivalent diameters as geometrical size functions for estimating CT dose in the thoracic, abdominal, and pelvic regions

Dewi W.K.[a], Anam C.[a], Hidayanto E.[a], Nitasari A.[a], Dougherty G.[b]

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[b] Department of Applied Physics and Medical Imaging, California State University Channel Islands, Camarillo, 93012, CA, United States

Abstract

Author keywords

Abstract

Purpose: The aim of this work was to establish the relationships of patient size in terms of effective diameter (Deff) and water-equivalent diameter (Dw) with lateral (LAT) and anterior-posterior (AP) dimensions in order to predict the specific patient dose for thoracic, abdominal, and pelvic computed tomography (CT) examinations. Methods: A total of 47 thoracic images, 79 abdominal images, and 50 pelvic images were analyzed in this study. The patient's images were retrospectively collected from Dr. Kariadi and Kensaras Hospitals, Semarang, Indonesia. The slices measured were taken from the middle of the scan range. The calculations of patient sizes (LAT, AP, Deff, and Dw) were automatically performed by IndoseCT 20b software. Deff and Dw were plotted as functions of LAT, AP, and AP+LAT. In addition, Dw was plotted as a function of Deff. Results: Strong correlations of Deff and Dw with LAT, AP, and AP+LAT were found. Stronger correlations were found in the Deff

curves (R2 > 0.9) than in the Dw curves (R2 > 0.8). It was found that the average Deff was higher than the average Dw in the thoracic region, the average values were similar in the abdominal and pelvic regions. Conclusion: The current study extended the study of the relationships between Deff and Dw and the basic geometric diameter LAT, AP, and AP+LAT beyond those previously reported by AAPM. We evaluated the relationships for three regions, i.e. thoracic , abdominal , and pelvic regions. Based on our findings, it was possible to estimate Deff and Dw from only the LAT or AP dimension. © 2021 Winda Kusuma Dewi et al.

Author keywords

anterior-posterior dimension; computed tomography; effective diameter ; lateral dimension; water-equivalent diameter

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Journal

Polish Journal of Medical Physics and Engineering

The Journal of Polish Society of Medical Physics

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The Journal publishes original contributions in medical physics and biomedical engineering, involving new methods and techniques, clinical applications, technological developments, research studies, and experimental science. Most of the publications concern the following subject categories: radiotherapy (including brachytherapy), radiology (X-ray, magnetic resonance, and ultrasound imaging), nuclear medicine (diagnostics and therapeutic applications), biosignals, biomedical engineering, and radiation protection. We accept manuscripts from all over the world and particularly invite young researchers from Poland to publish their first papers in the Journal.

PJMPE is a peer-reviewed, open-access scientific journal. The issues are published quarterly (March, June, September, December) in electronic form on the Journal's website (ISSN 1898-0309). Each manuscript has a DOI number assigned (digital object identifier). A printed version of the Journal used to be available in the past (ISSN 1425-4689). All manuscripts published since 2007 are freely available to all readers as PDF files on Journal's website (older issues have not been digitized).

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Dose calculation accuracy for photon small fields in treatment planning systems with comparison by Monte Carlo simulations

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Abstract

Purpose: Advanced radiation therapy techniques use small fields in treatment planning and delivery. Small fields have the advantage of more accurate dose delivery, but with the cost of some complications in dosimetry. Different dose calculation algorithms imported in various treatment planning systems (TPSs) which each of them has different accuracy. Monte Carlo (MC) simulation has been reported as one of the accurate methods for calculating dose distribution in radiation therapy. The aim of this study was the evaluation of TPS dose calculation algorithms in small fields against 2 MC codes.

Methods: A linac head was simulated in 2 MC codes, MCNPX, and GATE. Then three small fields (0.5×0.5, 1×1 and 1.5×1.5 cm^2) were simulated with 2 MC codes, and also these fields were planned with different dose calculation algorithms in Isogray and Monaco TPS. PDDs and lateral dose profiles were extracted and compared between MC simulations and dose calculation algorithms.

Results: For 0.5×0.5 cm^2 field mean differences in PDDs with MCNPX were 2.28, 4.6, 5.3, and 7.4% and with GATE were -0.29, 2.3, 3 and 5% for CCC, superposition, FFT and Clarkson algorithms respectively. For 1×1 cm^2 field mean differences in PDDs with MCNPX were 1.58, 0.6, 1.1 and 1.4% and with GATE were 0.77, 0.1, 0.6 and 0.9% for CCC, superposition, FFT and Clarkson algorithms respectively. For 1.5×1.5 cm^2 field mean differences in PDDs with MCNPX were 0.82, 0.4, 0.6 and -0.4% and with GATE were 2.38, 2.5, 2.7 and 1.7% for CCC, superposition, FFT and Clarkson algorithms respectively.

Conclusions: Different dose calculation algorithms were evaluated and compared with MC simulation in small fields. Mean differences with MC simulation decreased with the increase of field sizes for all algorithms.

Key words: small field; radiation therapy; Monte Carlo simulation; MCNPX; GATE; dose calculation algorithms.

Introduction

Advanced radiation therapy techniques such as IMRT, SBRT, and VMAT are using small photon beamlets (smaller than 4×4 cm^2) for treatment planning and treatment delivery.[1-3] Steep dose gradient in these fields results in a higher dose to target volume and simultaneously less dose to organs at risk (OARs),[4-6] this is the ultimate goal in radiation therapy.[5] However, using small fields will make some trouble in beam dosimetry.[1] The partial occlusion of primary photon beam from source, loss of lateral charged particle equilibrium, steep dose gradient and volume averaging in dosimeter are the major issues that make dosimetry in the small field a challenging work.[1,2,7-9] Because of these problems, there is no ideal dosimeter for use in small fields.[9] Tissue equivalent, energy and dose rate independence, linear response, high resolution and small relative size are the ideal characteristics of a suitable detector for the dosimetry of small fields.[1] Various dosimeters have been used for small field dosimetry despite all challenges and limitations, such as small volume ion chambers, radiochromic films, diodes, diamond detectors, and plastic scintillators.[1,10,11]

Monte Carlo (MC) simulation was used to calculate dose distribution in small field radiotherapy, in various studies.[2,12-14] Since MC simulation takes the exact geometry of linac, electron transport, and beam configurations into account,[15-16] it precision does not limit by complications from advanced techniques (such as IMRT and small fields) and tissue heterogeneities.[15] It was mentioned that MC simulation is one of the most accurate approaches to calculate dose distribution in radiation therapy dosimetry.[1,2,12,15-17] MC techniques are accepted as the gold standard in radiotherapy dose calculation.[1,18] It is known that MC will give accurate dose calculation in regions of charged particle disequilibrium and where measurement interpretation is challenging.[1] So MC simulation has considered as standard practice in benchmarking dose calculation algorithms used in

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Scientific Paper

Quantitative and dosimetric analysis for treating synchronous bilateral breast cancer using two radiotherapy planning techniques

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Abstract

Objective: We compared mono-isocenter and dual-isocenter plans in synchronous bilateral breast cancer (SBBC), which is defined as tumours occurring simultaneously in both breasts, and evaluated the effects of these differences in plans on organs-at-risk (OARs).

Materials and methods: We evaluated 10 women with early stage, nod negative (Tis-2N0M0) SBBC. The treatment dose was determined to be 50 Gy. We used mean dose and V_{XGy} to evaluate the OARs. To evaluate the effectiveness of treatment plans, Homogeneity index (HI), conformity index (CI) and sigma index (SI) and monitor units (MU) of mono-isocenter (MIT) and dual-isocenter (DIT) plans were compared. During bilateral breast planning, for the single-centre plan, the isocenter was placed at the center of both breasts at a depth of 3-4 cm. For the two-center plan, dual-isocenters were placed on the right and left breasts.

Results: No significant difference between the techniques in terms of the scope of the target volume was observed. Statistically significant results were not achieved in MIT and DIT plans for OARs. Upon comparing MIT and DIT, the right-side monitor unit (MU) value in DIT ($p = 0.011$) was statistically significantly lower than that in MIT. Upon comparing right-left side MIT and DIT, the MU value ($p = 0.028$) was significantly lower in DIT than MIT.

Conclusion: SBBC irradiation is more complex than unilateral breast radiotherapy. No significant difference between both techniques and OARs was observed. However, we recommend MIT as a priority technique due to the ability to protect OARs, ease of administration during treatment, and the fact that the patient stays in the treatment unit for a shorter period of time.

Key words: dosimetric comparison; mono-isocenter; dual-isocenter; synchronous bilateral breast cancer.

Introduction

Breast cancer is the most commonly diagnosed malignancy in the population of women globally.[1] With the increase in the incidence of breast cancer and life expectancy, the incidence of developing bilateral breast cancer has also increased.[1] The incidence of synchronous bilateral breast cancer (SBBC) is between 0.3%-12% of breast cancers.[2] The frequency of SBBC in our clinic is 2.2%.

The surgical treatment method in SBBC is selected according to the location of the tumour in the breast, size, breast–tumour ratio, age of patient, requirements of the patient, and whether it has spread to the axillary lymph nodes. Breast-conserving surgery (BCS) was shown to provide results comparable to mastectomy.[3] For patients with early-stage breast cancer, radiotherapy to the protected breast after breast protective surgery reduces the risk of local recurrence and cancer-related death.[4] Synchronous irradiation of both breasts after BCS in patients with SBBC is a challenge and complicated due to the need for minimizing dose to the heart and lungs.

To the best of our knowledge, this study is the first to compare mono-isocenter and dual-isocenter 3-D conformal field-in-field (FinF) plans and to evaluate the effects of these differences in plans on organs-at-risk.

Material and methods

We evaluated 10 women who underwent adjuvant radiotherapy after breast-conserving surgery with a diagnosis in the early stage, nod negative (Tis-2N0M0) SBBC. The median age of the patients was 57 (36–69) years, and the follow-up time was 41 months. We did not evaluate the boost plans because the tumour locations and sizes were different. To remain stable during the treatment, each patient was given a special vacuum bag that could be fixed to the breast surface while the patients were tied together in the back position, with their hands on the head.