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THE UTILIZATION OF COMPUTED TOMOGRAPHY SCANS FOR THE PURPOSE OF PLANNING RADIATION THERAPY TREATMENTS IN THE EFFECT OF SCAN PROTOCOL CHANGES

[1]Dr. Shabnam Naseem, [2]Dr. Amir Latif, [3]Dr Ammar Zahid Sheikh
[1]PIMS, Islamabad, [2]Jinnah Hospital Lahore, [3]Shaikh Zayed Medical Complex Lahore.

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Abstract:
Aim: *This paper surveys distributions identified with the utilization of CT filters for radiotherapy treatment arranging, explicitly the effect of output convention changes on CT number and treatment arranging dosimetry and on CT picture quality.*
Methods: *A pursuit on PubMed and EMBASE and an ensuing survey of references yielded 53 applicable papers. Our current research was conducted at Sir Ganga Ram Hospital, Lahore from May 2019 to April 2020.*
Results: *The limits of CT filters mainly influence the image quality. Some also influence the values of the Hounsfield (HU) unit, but this is not discussed in detail. It has been found that cylinder age changes in kilovolt and, on some scanners, field of view and re-calculations, cause significant changes in HU. The level of HU change that can be supported without changing the arrangement portion by more than 2% depends on the area and size of the body, the arrangement calculations, the energy of the treatment bar and the type of plane. A change in the HU estimate for delicate tissues has a more noticeable effect than HU changes for bone and air. The use of human appearances is suggested when evaluating HU changes.*
Conclusion: *There is restricted distributed work on CT check convention streamlining in radiotherapy. Distributions recommend that HU resilience of +/ - 20 HU for delicate tissue and +/ - 50 HU for lung and bone would confine portion changes in the treatment plan to under 2%.*
Keywords: *Computed Tomography Scans, Radiation Therapy Treatments, Dosimetry.*

Corresponding author:
Dr. Shabnam Naseem,
PIMS, Islamabad.

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INTRODUCTION:

The CT images used in the organization of radiotherapy treatments must meet two essential needs: to allow, with great mathematical dedication, the precise recognition of the situation of the tumor and the tissues surrounding the organs at risk; and to provide a guide to the electron thickness data for the different tissues to be used in the estimation of the part of the treatment organization framework [1]. Most radiotherapy facilities are currently approaching dedicated scanners that are designed exclusively for radiotherapy [2]. Therefore, there is an open door to improve examination conventions in order to best help imaging targets for radiotherapy [3. The CT control conventions used in indicative imaging offices regularly change the remake calculations, slice width, tube current, field of view (FOV) and various limits to provide excellent images to coordinate the imaging task. On radiotherapy scanners, a "one size fits all" approach is adopted in some cases with a negligible variety of output parameters. This traditionalism can be identified with the fear that fluctuating output limits may change the HU values in the images, and thus cause errors in the dosimetry data created in the TPS [4]. The disadvantage of this approach is that the nature of the images may be altered, implying that the recognizable evidence and presentation of key structures are performed on an imperfect image. In addition, errors and fluctuations in the tracing cycle are noticeable, which may indicate a critical source of vulnerability in the radiotherapy process [5].

METHODOLOGY:

Searches were conducted using PubMed and EMBASE. The survey was limited to articles in English and, initially, to articles distributed between 2019 and 2020. Our current research was conducted at Sir Ganga Ram Hospital, Lahore from May 2019 to April 2020. The main terms used were radiotherapy layout, treated tomography, alignment, phantoms, electron thickness, image quality. The survey was limited by the categorical prohibition of articles with accompanying terms: PET, SPECT, ultrasound, 4D gated, brachytherapy. The hunt was thus strengthened by examining the arrangement of references in the articles that were scanned in detail. In addition, review articles on the use of imaging in radiotherapy distributed in the specialized magazine SCOPE of the Institute of Physics and Drug Engineering were checked for additional references. The only distributions that discussed the use of CT imaging for the organization of radiation therapy and related sources of error were selected for the background study.

RESULTS:

169 articles were recognized and, after review of title and edited compositions, 58 were selected as relevant. Of these, 18 dealt with aspects of CT image quality, while the remainder focused on TPS designation or dosimetry changes in layout due to varieties in the CT image. TPS models the cooperation of the treatment radiating within the patient and, using a portion estimation calculation, produces a representation of the portion corrected for thickness. Corporate TPS uses different types of layout calculations. They are distinguished by their complexity and the approach used to display the interactions between the trees. The calculation decision influences the accuracy of the portion representation for various processing systems and the counting speed. The CT setting is a plot of HU values as a function of relative electron thickness for a range of various materials. RED is the electron thickness of a material relative to water. Typical RED grades are 0.3 for lung, 1.0 for water, and 1.6 for bone.

Table 1:

rences	RED value	Defined RED or HU tolerance
SMP[34,35]	0.2	±0.05 (±25%)
	0.2	±0.004 (±2%)
	0.4	±0.008 (±2%)
	0.21	±0.02 (±10%) or 20 HU
	0.2	±50 HU
SMP[34,35]	1.0	±0.05 (±5%)
	1.0	±0.01 (±1%)
	1.06	±0.02 (±2%) or 20 HU
	1.0	±30 HU
SMP[34,35]	1.5	±0.1 (±7%)
	1.3	±0.03 (±2%)
	1.8	±0.04 (±2%)
	1.6	±0.02 (±1%) or 20 HU
	1.3	±50 HU

Physicists in Medicine; ESTRO, European Society for Radiotherapy and Onc
:y; IPEM, Institute of Physics and Engineering in Medicine; RED, relative electro

omas[24] equations.

Table 2:

[illegible]		(TPS)	CBCT	change	change	change	plan (%)	
[illegible]	Clinical brain	Collapsed cone convolution (Pinnacle; Philips, Amsterdam, Netherlands)	CBCT	Not given	20	250	<1	Chu et al
[illegible]	Clinical brain, five wedged fields	Modified Batho method (Eclipse™; Varian, CA)	CBCT to PCT	Not given	15	Not given	<1	Yoo et al
[illegible]	Clinical brain, four conformal fields	Modified Batho power law (Varian Cadplan®; Varian, CA)	PCT	50° (RED change 0.05)	30° (RED change 0.03)	150° (RED change 0.08)	1.8	Kilby et al
[illegible]	Clinical lung	Collapsed cone convolution (Pinnacle)	CBCT	Not given	20	250 HU	<2	Chu et al
[illegible]	Clinical lung, three field	Modified Batho power law (Varian Cadplan)	PCT	50° (RED change 0.05)	30° (RED change 0.03)	150° (RED change 0.08)	1.5	Kilby et al
[illegible]	Clinical lung, VMAT 225°	Collapsed cone convolution (Pinnacle)	CBCT to PCT	−300 to −100 HU	Not given	Not given	−10	Disher et al
[illegible]	Clinical lung, VMAT 225°	Collapsed cone convolution (Pinnacle)	CBCT to PCT	−200 to +200	Not given	Not given	+10	Disher et al
[illegible]	Clinical lung, VMAT 225°	Collapsed cone convolution (Pinnacle)	CBCT to PCT	200 to +200	Not given	Not given	Close match	Disher et al
[illegible]	Clinical pelvis	Collapsed cone convolution (Pinnacle)	CBCT	Not given	20	250	<2	Chu et al
[illegible]	Clinical pelvis, five field	Anisotropic analytic algorithm (Eclipse)	CBCT to PCT	100	0	100	<1	Hatton et al
[illegible]	Clinical pelvis, seven field IMRT	Anisotropic analytic algorithm (Eclipse)	CBCT to PCT	20	20	500	3.4	Guan and Dong
[illegible]	Clinical pelvis, seven field IMRT	Anisotropic analytic algorithm (Eclipse)	CBCT to PCT	20	20	200	0.6	Guan and Dong
16	Clinical prostate, three field conformal	Modified Batho power law (Varian Cadplan)	PCT	50° (RED change 0.05)	30° (RED change 0.03)	150° (RED change 0.08)	1.7	Kilby et al
18	Clinical pelvis, [illegible]	Anisotropic analytic [illegible]	CBCT [illegible]	20	20	500	2.6	Guan [illegible]

DISCUSSION:

The selected reproduction calculations influenced the cut width of the image on the Toshiba Aquiline One scanner with softer calculations widening the cut width. Similarly, the lens in the hub plane fluctuated fundamentally depending on the re-creation calculation used, with more accurate calculations creating greater agitation while improving the high differentiation lens. This has also been observed on other brands and models of scanners [6]. The FOV re-creation, as well as the associated lattice, will significantly affect the deception of small details. A smaller FOV will improve the perceptibility of small details compared to a larger FOV. Determining the size of the center point of the X-beam tube will also have a marginal impact on the quality of fine detail in the image, with a smaller center improving the visibility of detail [7]. Cylinder voltage, intensity and pitch mostly impact image quality and hours of operation when they are changed, regardless of the scanner make or model. The progressions presented when changing the field of view and the recalculations, in all cases, move significantly from one producer to the next [8]. Reproductive calculi in particular are generally less familiar to clinical clients. When the scanner's informational index is used to create carefully recreated radiographs (CIR), the quality of the CIR image is dictated by both the limitations of the scanner filter and the CIR counting algorithm [9]. The limitations that will influence the quality of the CIR image are essentially the thickness of the image section, the distance between images, the absolute insertion time and the size of the focal point. It seems that the tonality factor influences the ability to see objects with low differentiation in RRC in all cases, when the mA power is kept constant. Higher tones decrease differentiation in DRR while decreasing the comprehension portion. Gradually, the use of DRR is supplanted by 3D coordination, so that some relevant references are incorporated here [10].

CONCLUSION:

From the distributions identified with the disposition of the portion changes emerging from the RED or HU change, the following conclusions can be drawn: a given difference in HU or RED will cause a larger portion change for a greater tissue thickness, and a decrease in tissue thickness; in this way, the effect of the HU change will move to different parts of the body; a single setting treatment plan will cause a larger portion change for a particular HU change than a mixed setting treatment plan; the use of a low energy treatment bar will cause a larger portion change for a given HU change than with a higher energy. Because of the importance of delicate body tissues relative to bone or air, a change in the unit of mass for delicate tissues has a greater effect than a change in the unit of mass for bone or air. Note that the arrangement calculation used affects the accuracy of the arrangement part. Some are more accurate than others for the treatment of various areas of the body. 23, 73 Hence, any attempt to relate the change in HU to the change in GST portion must take into account the calculation used and, in addition, the body district.

REFERENCES:

1. Schneider U, Pedroni E, Lomax A. The calibration of CT Hounsfield units for radiotherapy treatment planning.Phys Med Biol 1996; 41: 111-124.
2. Khan FM, Gibbons JP. The Physics of Radiation Therapy. Fifth Edition. Philadelphia, USA. Pub Lippincott, Williams and Wilkins. 2014.
3. American Association of Physicists in Medicine Task Group 53; Quality assurance for clinical radiotherapy treatment planning. Med Phys 1998; 25 (10); 1773-1829. Report 62.
4. Venselaar J, Welleweerd H, Mijnheer B. Tolerances for accuracy if photon beam dose calculations of treatment planning systems. Radiother Oncol 2001; 60: 191-201.
5. IAEA Human Health Series, No. 19, Quality Assurance Programme for Computed Tomography: Diagnostic and Therapy Applications. Vienna, Austria. IAEA, 2012
6. Commissioning of Radiotherapy Treatment Planning Systems: Testing for Typical External Beam Treatment Techniques .TECDOC 1583. Vienna, Austria. International Atomic Energy Agency. 2008.
7. Thomson E, Edyvean S. Section 3.2. In: IPEM Report 88 - Physical aspects of quality control in radiotherapy. York, UK. Institute of Physics and Engineering in Medicine. 1999
8. Kilby W, Sage J, Rabett V. Tolerance levels for quality assurance of electron density values generated from CT in radiotherapy treatment planning. Phys Med Biol 2002; 47: 1485-1493.
9. Mijnheer B, Olszewska A, Fiorino C, Hartmann G, Knoos T, Rosenwald JC et al. Estro Booklet No. 7 Quality assurance of treatment planning systems. Practical examples for non-IMRT photon beams. Brussels, Belgium. European Society for Radiotherapy and Oncology. 2004.
10. Swiss Society for Radiobiology and Medical Physics (SGSMP/SSRPM/SSRFM) Quality control of treatment planning systems for teletherapy. Quality control of treatment planning systems for teletherapy. SGSMP Report 7. 1997.