University Hospitals Bristol NHS
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Radiotherapy

Evidence Update

March/April 2018

Respecting everyone
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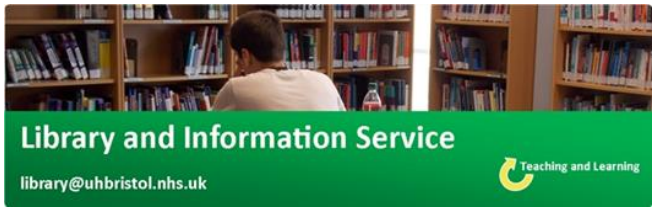

Contents

Current Journals: Tables of Contents

Click on journal title (+ Ctrl) for hyperlink

Journal	Month	Volume	Issue
Radiotherapy and Oncology	March 2018	126	3
International Journal of Radiation Oncology Biology and Physics	01 May 2018	101	1
Clinical Oncology	May 2018	30	5

If you require full articles please email: library@uhbristol.nhs.uk

Lunchtime Drop-in Sessions

All sessions last one hour

April (12.00-13.00)

5th (Thu) **Literature Searching**

9th (Mon) **Critical Appraisal**

17th (Tue) **Statistics**

25th (Wed) **Literature Searching**

May (13.00-14.00)

3rd (Thu) **Critical Appraisal**

11th (Fri) **Statistics**

14th (Mon) **Literature Searching**

22nd (Tue) **Critical Appraisal**

30th (Wed) **Statistics**

Your Outreach Librarian – Sarah Barrett

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Library Clinic

Stop by and find out more about our services. We will be here to answer any questions you may have!

May 2nd: **Canteen (Level 9, BRI)** *12.00-14.00*

June 6th: **Terrace (Level 4, Education Centre)** *12.00-14.00*

June 19th: **Welcome Centre, BRI** *10.00-16.00*

July 3rd: **Welcome Centre, BRI** *10.00-16.00*

July 4th: **Canteen (Level 9, BRI)** *12.00-14.00*

August 8th: **Foyer, Education Centre** *12.00-14.00*

August 29th: **Foyer, St Michael's Hospital** *12.00-14.00*

September 5th: **Canteen (Level 9, BRI)** *12.00-14.00*

September 11th: **Welcome Centre, BRI** *10.00-16.00*

October 3rd: **Terrace (Level 4, Education Centre)** *12.00-14.00*

November 7th: **Canteen (Level 9, BRI)** *12.00-14.00*

December 5th: **Foyer, Education Centre** *12.00-14.00*

December 11th: **Welcome Centre, BRI** *10.00-16.00*

Latest Evidence

NICE National Institute for Health and Care Excellence

Intrabeam radiotherapy system for adjuvant treatment of early breast cancer (TA501)

Evidence-based recommendations on using Intrabeam radiotherapy during breast-conserving surgery for adults with early breast cancer

Technology appraisal guidance Published January 2018

Cochrane Library

De-intensified adjuvant (chemo)**radiotherapy** versus standard adjuvant chemoradiotherapy post transoral minimally invasive surgery for resectable HPV-positive oropharyngeal carcinoma

James Howard , Raghav C Dwivedi , Liam Masterson , Prasad Kothari , Harry Quon and F. Christopher Holsinger
Online Publication Date: April 2018

Chemotherapy and **radiotherapy** for advanced pancreatic cancer

Venessa Chin , Adnan Nagrial , Katrin Sjoquist , Chelsie A O'Connor , Lorraine Chantrill , Andrew V Biankin , Rob JPM Scholten and Desmond Yip
Online Publication Date: March 2018

UpToDate®

OpenAthens login required. Register here: https://openathens.nice.org.uk/

Adjuvant radiation therapy for women with newly diagnosed, non-metastatic breast cancer

Author: Jennifer F De Los Santos, MD

Section Editors: Daniel F Hayes, MD; David E Wazer, MD

Deputy Editor: Sadhna R Vora, MD

Contributor Disclosures

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: Mar 2018. | **This topic last updated:** Aug 17, 2017.

Cardiotoxicity of radiation therapy for breast cancer and other malignancies

Authors: Lawrence B Marks, MD; Louis S Constine, MD; M Jacob Adams, MD, MPH

Section Editors:William J McKenna, MD; Steven E Schild, MD

Deputy Editor: Sadhna R Vora, MD

Contributor Disclosures

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: Mar 2018. | **This topic last updated:** Aug 09, 2017.

Radiation therapy techniques in cancer treatment

Author: Timur Mitin, MD, PhD

Section Editor: Jay S Loeffler, MD

Deputy Editor: Michael E Ross, MD

Contributor Disclosures

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: Mar 2018. | **This topic last updated:** Aug 01, 2017.

Radiation therapy in the management of melanoma

Author: Angela M Hong, MBBS, MMed, PhD, FRANZCR

Section Editor: Michael B Atkins, MD

Deputy Editor: Michael E Ross, MD

Contributor Disclosures

All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: Mar 2018. | **This topic last updated:** Mar 21, 2018.

Royal College of Radiologists

The Society of Radiographers

Institute of Physics and Engineering in Medicine

Adaptive Approaches and Online Monitoring of Radiotherapy Treatment

25 April 2018
Manchester Conference Centre

Organised by IPEM's Radiotherapy Special Interest Group

Recent Database Articles

Below is a selection of articles recently added to the healthcare databases, grouped in the category:

Radiotherapy planning for breast cancer

If you would like any of the articles in full text, or if you would like a more focused search on your own topic, please contact us: library@bristol.nhs.uk

1. Radiation therapy of synchronous bilateral breast carcinoma (SBBC) using multiple techniques.

Author(s): Kim, Sung Jin; Lee, Mi Jo; Youn, Seon Min

Source: Medical dosimetry : official journal of the American Association of Medical Dosimetrists; ; vol. 43 (no. 1); p. 55-68

Publication Type(s): Journal Article

PubMedID: 28988893

Abstract: The purpose of this study was to establish intensity-modulated radiation therapy (IMRT) and volumetric-modulated arc therapy (VMAT) treatment plans for synchronous bilateral breast

cancer (SBBC) and to compare those plans with the previous treatment plans using 3D conformal radiation therapy (3DCRT). The differences among the treatments were also statistically compared regarding dosimetry distribution and treatment efficiency. The research was conducted with 10 SBBC patients. The study established IMRT (12 fields with a single isocenter) and VMAT (2 partial arcs with a single isocenter) treatment plans for SBBC patients and then compared those plans with 3DCRT (8 fields with multiple isocenters). The plans were evaluated based on a dose-volume histogram analysis. For planning target volumes (PTVs), the mean doses and the values of V95%, V105%, conformity index, and homogeneity index were reported. For the organs at risk, the analysis included the mean dose, maximum dose, and VXGy, depending on the organs (lungs, heart, and liver). To objectively evaluate the efficiency of the treatment plans, each plan's beam times, treatment times (including set-up time), and monitor units were compared. Tukey test and one-way analysis of variance were used to compare the PTV and organs at risk values of the 3 techniques. Additionally, the independent-samples t-test was used to compare the 2 techniques (IMRT and VMAT) based on the values of Rt. PTV and Lt. PTV ($p < 0.05$). For PTV dose distribution, IMRT showed increases of approximately 1.2% in Dmean and of approximately 5.7% in V95% dose distribution compared with 3DCRT. In comparison to VMAT, 3DCRT showed about 3.0% higher dose distribution in Dmean and V95%. IMRT was the best in terms of conformity index and homogeneity index ($p < 0.05$), whereas 3DCRT and VMAT did not significantly differ from each other. In terms of dose distribution on lungs, heart, and liver, the percentage of volume at high doses such as V30Gy and V40Gy was approximately 70% lower for IMRT and approximately 40% lower for VMAT than for 3DCRT. For distribution volumes of low doses such as V5% and V10%, that for 3DCRT was approximately 60% smaller than for IMRT and approximately 70% smaller than for VMAT. Comparison between IMRT and VMAT showed that the IMRT was superior in all distribution factors. VMAT showed better treatment efficiency than 3DCRT or IMRT. Among the SBBC radiotherapy treatment plans, IMRT was superior to 3DCRT and VMAT in terms of PTV dose distribution, whereas VMAT showed the most outstanding treatment efficiency.

Database: Medline

2. Dosimetric comparison of treatment plans using physical wedge and enhanced dynamic wedge for the planning of breast radiotherapy

Author(s): Gopalakrishnan Z.; Nair R.K.; Raghukumar P.; Sarin B.

Source: Journal of Medical Physics; 2018; vol. 43 (no. 1); p. 46-51

Publication Date: 2018

Publication Type(s): Article

Available at Journal of Medical Physics - from Europe PubMed Central - Open Access

Available at Journal of Medical Physics - from jmp.org.in

Abstract: The aim of this study is to compare the physical wedge (PW) with enhanced dynamic wedge (EDW) to determine the difference in the dose distribution affecting the treated breast and the contralateral breast, lungs, heart, esophagus, spine, and surrounding skin in the radiotherapy of breast cancer. Computed tomography (CT) data sets of 30 breast cancer patients were selected from the database for the study. The treatment plans which were executed with PW were re-planned with EDW without changing the beam parameters. Keeping the wedge angles same, the analytic anisotropic algorithm (AAA) with heterogeneity correction was used for dose calculation in all plans. The prescription was 50 Gy in 25 fractions. The dose-volume histogram (DVH) of the planning target volume (PTV) and critical structures of both PW and EDW plans were analyzed. The analysis showed that the maximum dose within the target volume is higher in EDW plan compared to PW plan. However the PTV conformity index (CI) remained the same in both plans. For all the critical

structures, the EDW technique offered less dose compared to PW technique. The effect of volume of the contralateral breast on the dose to contralateral breast and the effect of volume of PTV breast for patients with carcinoma left breast on the dose to heart were studied and analyzed for the two wedges. No correlation between volumes and dose parameters was found for the two techniques. The number of monitor units to deliver a particular dose with EDW field is less than that of PW field due to change in wedge factor. As EDW produces less scattered dose to structures outside the treatment field, the risk of a second malignancy can be reduced with this technique.

Database: EMBASE

3. Comparison of acute toxicities between contemporary forward-planned 3D conformal radiotherapy and inverse-planned intensity-modulated radiotherapy for whole breast radiation.

Author(s): Guttmann, David M; Gabriel, Peter; Kennedy, Christopher; Rate, William; Grizos, William; Nagda, Suneel; Wojtowicz, Lisa; Lin, Lilie; Freedman, Gary M

Source: The breast journal; Mar 2018; vol. 24 (no. 2); p. 128-132

Publication Date: Mar 2018

Publication Type(s): Journal Article

PubMedID: 28703444

Abstract: The use of inverse-planned intensity-modulated radiation therapy for whole breast radiation treatment has become more prevalent, but this may impose an increased cost on the health system. We hypothesized that when applied with the same treatment planning goals, tangential forward-planned field-in-field 3D conformal radiotherapy and tangential inverse-planned intensity-modulated radiotherapy would be associated with comparable toxicities. Women who underwent tangential whole breast irradiation at our institution from 2011 to 2015 planned using either forward-planned field-in-field 3D conformal radiotherapy or intensity-modulated radiotherapy were retrospectively analyzed. Grade 2+ Radiation dermatitis was the primary endpoint. A total of 201 and 212 women had undergone field-in-field 3D conformal radiotherapy and intensity-modulated radiotherapy, respectively. No differences were observed between the two modalities regarding acute radiation dermatitis, breast pain, or fatigue. In a multivariable logistic regression that incorporated the use of boost, hypofractionation, use of chemotherapy, patient positioning, use of a supraclavicular field, and breast planning target volume, intensity-modulated radiotherapy was not correlated with different rates of Grade 2+ radiation dermatitis. This study supports the routine first-line use of field-in-field 3D conformal radiotherapy for whole breast radiation instead of tangential intensity-modulated radiotherapy from the standpoint of equivalence in acute toxicity. Further investigation is needed to assess whether there are subgroups of women who may still benefit from intensity-modulated radiotherapy.

Database: Medline

4. Setup reproducibility and junction stability in DIBH and free breathing nodal irradiation for breast cancer

Author(s): Benson M.; Milburn T.; Beer K.; Poder J.; Ralston A.

Source: Journal of Medical Radiation Sciences; Mar 2018; vol. 65 ; p. 27

Publication Date: Mar 2018

Publication Type(s): Conference Abstract

Available at Journal of medical radiation sciences - from Wiley Online Library Free Content - NHS

Available at Journal of medical radiation sciences - from Europe PubMed Central - Open Access

Available at Journal of medical radiation sciences - from PubMed Central

Abstract: Objective: The primary objective of this study is to determine whether the deep inspiration breath hold (DIBH) technique for patients receiving nodal irradiation for breast cancer results in a more reproducible setup than free breathing (FB). We hypothesise that dose received across the junction will be more reproducible than for FB patients. The dose represented on the radiotherapy plan across the junction level will therefore be more accurate. Method: A minimum of 20 patients (10 FB and 10 DIBH) were set up for treatment with a kV imaging threshold of 0.3 cm and DIBH patients were treated using Varian Real-time Position Management (RPM) software with a 0.5 cm amplitude threshold. Orthogonal kV images of DIBH and FB patients were reviewed to determine the range of isocentre shifts in the Sup/INF direction. The patients had Gafchromic EBT3 films placed over the supraclavicular and tangent junction for six fractions throughout their treatment. Results: The EBT3 films showed acceptable dose uniformity in the junction region for all patients. The average Sup/INF shift was 0.2 cm +/- 0.2 cm (1 SD) and 0.5 cm +/- 0.4 cm (1 SD) for DIBH and FB respectively (see Figure). Discussion: As expected, FB patients had significantly greater Sup/INF shifts than DIBH patients. FB patients have the same imaging threshold however no threshold for respiration is applied, resulting in dose feathering across the junction throughout the full respiratory cycle. A junction with both RPM and imaging thresholds (DIBH) should provide greater intra-fractionation stability and accuracy in dose as represented on the radiotherapy plan. [Figure Presented].

Database: EMBASE

5. Interim report of a clinical registry: 669 patients implanted with a 3-d bioabsorbable marker

Author(s): Cross M.; Kaufman C.; Kuske R.; Smith L.A.; Eladoumikdachi F.; Devisetty K.; Dekhne N.; Dilworth J.; Edmonson D.; Gass J.; Hong R.; Barone J.; Patton B.; Phillips R.; Tafra L.; Smith A.

Source: Annals of Surgical Oncology; Feb 2018; vol. 25 (no. 1)

Publication Date: Feb 2018

Publication Type(s): Conference Abstract

Abstract:INTRODUCTION: Studies show Oncoplastic (OPS) reconstruction improves patient outcomes following breast conserving surgery (BCS). Previous reports indicate that a 3-D bioabsorbable implant placed during lumpectomy facilitates OPS by providing a dependable tumor bed target for radiation, a scaffold for OPS closure with consistent reports of good/excellent cosmesis. This interim report summarizes data collected in an IRB-approved Registry started in 2012. Methods: A bioabsorbable 3-D implant was implanted at the tumor excision site during lumpectomy and was used for planning and targeting breast irradiation. Data includes patient demographics, breast size, tumor characteristics, surgical and radiotherapy techniques, cosmesis and follow-up. Results: Following informed consent, 669 patients from 13 centers were enrolled in the implant registry. Median follow-up is 10 months with 148 subjects approaching 2 years. Tumor characteristics were T-1 (57%), T-2 (19%), DCIS (21%), node positivity (14%) and tumor location (upper outer 49%). Radiation oncologists verified the implant as "easily seen" on CT in 96% of cases and 96% found "improved accuracy" in boost targeting. 87% of radiation oncologists rated the device as fairly or very useful for boost planning. Oncoplastic closure was used in 98% of patients with 63% using the device as a scaffold for tissue support. Cosmesis was highly rated as "good" or "excellent" at 6, 12, and 24 months by surgeons (95%, 94%, 90%) and by patients (96%, 93%, 88%). The device contributed to the cosmetic benefit for each time period (89%, 93%, and 91%). Table 1 summarizes the data as well as surgical complication and re-excision rates. Conclusion: This interim report notes benefits of a 3-D bioabsorbable implant placed during lumpectomy. The device

provides a dependable target for radiation, a scaffold for oncoplastic tissue rearrangement with reported good/excellent cosmesis in >90% of patients. This report of 669 patients describes evidence that this device may help to achieve multiple goals. Further collection of data over time will validate these interim findings.

Database: EMBASE

6. Setup in a clinical workflow and impact on radiotherapy routine of an in vivo dosimetry procedure with an electronic portal imaging device

Author(s): Li J.; Wang P.; Kang S.; Xiao M.; Tang B.; Liao X.; Xin X.; Orlandini L.C.; Piermattei A.; Grusio M.

Source: PLoS ONE; Feb 2018; vol. 13 (no. 2)

Publication Date: Feb 2018

Publication Type(s): Article

Available at PloS one - from Public Library of Science (PLoS)

Available at PloS one - from Europe PubMed Central - Open Access

Available at PloS one - from EBSCO (MEDLINE Complete)

Available at PloS one - from PubMed Central

Abstract: High conformal techniques such as intensity-modulated radiation therapy and volumetric-modulated arc therapy are widely used in overloaded radiotherapy departments. In vivo dosimetric screening is essential in this environment to avoid important dosimetric errors. This work examines the feasibility of introducing in vivo dosimetry (IVD) checks in a radiotherapy routine. The causes of dosimetric disagreements between delivered and planned treatments were identified and corrected during the course of treatment. The efficiency of the corrections performed and the added workload needed for the entire procedure were evaluated. The IVD procedure was based on an electronic portal imaging device. A total of 3682 IVD tests were performed for 147 patients who underwent head and neck, abdomen, pelvis, breast, and thorax radiotherapy treatments. Two types of indices were evaluated and used to determine if the IVD tests were within tolerance levels: the ratio R between the reconstructed and planned isocentre doses and a transit dosimetry based on the gamma-analysis of the electronic portal images. The causes of test outside tolerance level were investigated and corrected and IVD test was repeated during subsequent fraction. The time needed for each step of the IVD procedure was registered. Pelvis, abdomen, and head and neck treatments had 10% of tests out of tolerance whereas breast and thorax treatments accounted for up to 25%. The patient setup was the main cause of 90% of the IVD tests out of tolerance and the remaining 10% was due to patient morphological changes. An average time of 42 min per day was sufficient to monitor a daily workload of 60 patients in treatment. This work shows that IVD performed with an electronic portal imaging device is feasible in an overloaded department and enables the timely realignment of the treatment quality indices in order to achieve a patient's final treatment compliant with the one prescribed.

Database: EMBASE

7. Improving oncoplastic breast tumor bed localization for radiotherapy planning using image registration algorithms.

Author(s): Wodzinski, Marek; Skalski, Andrzej; Ciepiela, Izabela; Kuszewski, Tomasz; Kedzierawski, Piotr; Gajda, Janusz

Source: Physics in medicine and biology; Jan 2018; vol. 63 (no. 3); p. 035024

Publication Date: Jan 2018

Publication Type(s): Journal Article

PubMedID: 29293469

Abstract: Knowledge about tumor bed localization and its shape analysis is a crucial factor for preventing irradiation of healthy tissues during supportive radiotherapy and as a result, cancer recurrence. The localization process is especially hard for tumors placed nearby soft tissues, which undergo complex, nonrigid deformations. Among them, breast cancer can be considered as the most representative example. A natural approach to improving tumor bed localization is the use of image registration algorithms. However, this involves two unusual aspects which are not common in typical medical image registration: the real deformation field is discontinuous, and there is no direct correspondence between the cancer and its bed in the source and the target 3D images respectively. The tumor no longer exists during radiotherapy planning. Therefore, a traditional evaluation approach based on known, smooth deformations and target registration error are not directly applicable. In this work, we propose alternative artificial deformations which model the tumor bed creation process. We perform a comprehensive evaluation of the most commonly used deformable registration algorithms: B-Splines free form deformations (B-Splines FFD), different variants of the Demons and TV-L1 optical flow. The evaluation procedure includes quantitative assessment of the dedicated artificial deformations, target registration error calculation, 3D contour propagation and medical experts visual judgment. The results demonstrate that the currently, practically applied image registration (rigid registration and B-Splines FFD) are not able to correctly reconstruct discontinuous deformation fields. We show that the symmetric Demons provide the most accurate soft tissues alignment in terms of the ability to reconstruct the deformation field, target registration error and relative tumor volume change, while B-Splines FFD and TV-L1 optical flow are not an appropriate choice for the breast tumor bed localization problem, even though the visual alignment seems to be better than for the Demons algorithm. However, no algorithm could recover the deformation field with sufficient accuracy in terms of vector length and rotation angle differences.

Database: Medline

8. Dosimetric effects of intrafractional isocenter variation during deep inspiration breath-hold for breast cancer patients using surface-guided radiotherapy.

Author(s): Kügele, Malin; Edvardsson, Anneli; Berg, Lovisa; Alkner, Sara; Andersson Ljus, Carina; Ceberg, Sofie

Source: Journal of applied clinical medical physics; Jan 2018; vol. 19 (no. 1); p. 25-38

Publication Date: Jan 2018

Publication Type(s): Journal Article

PubMedID: 29139223

Abstract: The aim of this study was to investigate potential dose reductions to the heart, left anterior descending coronary artery (LAD), and ipsilateral lung for left-sided breast cancer using visually guided deep inspiration breath-hold (DIBH) with the optical surface scanning system Catalyst™, and how these potential dosimetric benefits are affected by intrafractional motion in between breath holds. For both DIBH and free breathing (FB), treatment plans were created for 20 tangential and 20 locoregional left-sided breast cancer patients. During DIBH treatment, beam-on was triggered by a region of interest on the xiphoid process using a 3 mm gating window. Using a novel nonrigid

algorithm, the Catalyst™ system allows for simultaneous real-time tracking of the isocenter position, which was used to calculate the intrafractional DIBH isocenter reproducibility. The 50% and 90% cumulative probabilities and maximum values of the intrafractional DIBH isocenter reproducibility were calculated and to obtain the dosimetric effect isocenter shifts corresponding to these values were performed in the treatment planning system. For both tangential and locoregional treatment, the dose to the heart, LAD and ipsilateral lung was significantly reduced for DIBH compared to FB. The intrafractional DIBH isocenter reproducibility was very good for the majority of the treatment sessions, with median values of approximately 1 mm in all three translational directions. However, for a few treatment sessions, intrafractional DIBH isocenter reproducibility of up to 5 mm was observed, which resulted in large dosimetric effects on the target volume and organs at risk. Hence, it is of importance to set tolerance levels on the intrafractional isocenter motion and not only perform DIBH based on the xiphoid process.

Database: Medline

9. Intensity-modulated radiation therapy for early-stage breast cancer: is it ready for prime time?

Author(s): Chan, Tabitha Y; Tan, Poh Wee; Tang, Johann I

Source: Breast cancer (Dove Medical Press); 2017; vol. 9 ; p. 177-183

Publication Date: 2017

Publication Type(s): Journal Article Review

PubMedID: 28360536

Available at Breast Cancer: Targets and Therapy - from Europe PubMed Central - Open Access

Available at Breast Cancer: Targets and Therapy - from PubMed Central

Abstract: Whole breast external beam radiotherapy (WBEBRT) is commonly used as an essential arm in the treatment management of women with early-stage breast cancer. Dosimetry planning for conventional WBEBRT typically involves a pair of tangential fields. Advancement in radiation technology and techniques has the potential to improve treatment outcomes with clinically meaningful long-term benefits. However, this advancement must be balanced with safety and improved efficacy. Intensity-modulated radiation therapy (IMRT) is an advanced technique that shows promise in improving the planning process and radiation delivery. Early data on utilizing IMRT for WBEBRT demonstrate more homogenous dose distribution with reduction in organs at risk doses. This translates to toxicities reduction. The two common descriptors for IMRT are forward-planning "fields in field" and inverse planning. Unlike IMRT for other organs, the aim of IMRT for breast planning is to achieve dose homogeneity and not organ conformality. The aim of this paper was to evaluate whether IMRT is ready for prime time based on these three points: 1) workload impact, 2) the clinical impact on the patient's quality of life, and 3) the appropriateness and applicability to clinical practice.

Database: Medline

10. Use of 18F-FDG PET-CT imaging to determine internal mammary lymph node location for radiation therapy treatment planning in breast cancer patients.

Author(s): Davidson, Tima; Ben-David, Merav; Galper, Shira; Haskin, Tess; Howes, Megan; Scaife, Roland; Kanana, Nayroz; Amit, Uri; Weizman, Noam; Chikman, Bar; Goshen, Elinor; Ben-Haim, Simona; Symon, Zvi; Goldstein, Jeffrey

Source: Practical radiation oncology; 2017; vol. 7 (no. 6); p. 373-381

Publication Date: 2017

Publication Type(s): Journal Article

PubMedID: 28989000

Abstract:PURPOSEAdjuvant internal mammary lymph node (IMN) radiation is often delivered with 2-dimensional techniques that use anatomic landmarks and predetermined depths for field placement and dose specification. In contrast, 3-dimensional planning uses the internal mammary vessels (IMVs) to localize the IMNs for planning. Our purpose was to determine if localization of the involved IMN (i-IMN) by 18F-labeled fluorodeoxyglucose positron emission tomography-computed tomography (18F-FDG PET-CT) offers opportunities to improve treatment.METHODS AND MATERIALSBreast cancer patients (n = 80) who had i-IMNs (n = 112) on PET-CT for initial staging (n = 40) or recurrence (n = 40) were studied. Size, intercostal space (IC), and distance from skin, sternum, and IMVs were recorded. Effects on 2- and 3-dimensional planning were evaluated.RESULTSMost i-IMNs (94.6%) were in the first to third ICs. Few were in the fourth (4.5%) or fifth (0.9%) IC. Mean i-IMN depth was 3.4 cm (range, 1.1-7.3 cm). Prescriptive depths of 4, 5, and 6 cm would result in undertreatment of 25%, 10.7%, and 5.3% of IMNs, respectively. Most IMNs (86.6%) were lateral or adjacent to the sternal edge. Only 13.4% of IMNs were posterior to the sternum. Use of the ipsilateral or contralateral sternal edge for field placement increases the risk of geographic miss or excess normal tissue exposure. Most i-IMNs were adjacent to (83%) or ≤0.5 cm (14%) from the IMV edge. Three (3%) were >0.5 cm beyond the IMV edge. The clinical target volume (CTV) defined by the first to third ICs encompassed 78% of i-IMNs. IMN-CTV coverage of i-IMNs increased with inclusion of the fourth IC (82%), 0.5 cm medial and lateral margin expansion (93%), or both (96.5%).CONCLUSIONTwo-dimensional treatment techniques risk geographic miss of IMNs and exposure of excess normal tissue to radiation. An IMN-CTV defined by the IMVs from the first to third ICs with 0.5-cm medial and lateral margin expansion encompasses almost all i-IMNs identified on PET-CT imaging. Inclusion of the fourth IC offers modest coverage improvement, and its inclusion should be weighed against potential increase in cardiac exposure.SUMMARYThe use of 2-dimensional treatment techniques for adjuvant internal mammary lymph node (IMN) radiation may cause geographic miss of tumor and expose normal tissue to radiation injury. Conformal 3-dimensional planning improves coverage and reduces risk of normal tissue damage by using the internal mammary vessel to define an IMN clinical target volume (CTV). Contouring the IMN-CTV from the first to third intercostal spaces with a 0.5-cm expansion medially and laterally encompasses most IMN. Positron emission tomography-computed tomography may have a role in radiation planning by identifying involved-IMN for dose escalation.

Database: Medline

11. Understanding ESTRO-radiological pearls and pitfalls for delineating target volumes for radiotherapy in breast cancer

Author(s): Bhuva S.; Lee J.; Duane F.; Taylor C.; Andrade G.

Source: Cancer Imaging; 2017; vol. 17

Publication Date: 2017

Publication Type(s): Conference Abstract

Available at Cancer Imaging - from BioMed Central

Available at Cancer Imaging - from Europe PubMed Central - Open Access

Abstract: Learning objectives: To present the essential radiological components entailed in the ESTRO guidance, enabling radiologists to aid radiation oncologists with precise radiotherapy planning in breast cancer. Content organisation: Adjuvant radiotherapy in early stage breast cancer

is proven to reduce the risk of recurrence and improves survival outcomes, but exposes the heart, lungs and soft tissue to radiation related side-effects. Technological advances include a transition in radiotherapy planning from using 2D planar bony landmarks to a 3D CT-based delineation of nodal target volumes using vascular anatomy to localise regional nodal levels. We offer a practical, easy to follow, and illustrated guide to applying the ESTRO consensus guidelines (2016) on delineating the regional lymph nodes for adjuvant irradiation in early stage breast cancer. We will: 1. Clarify the lexicon regarding 3D localisation. 2. Highlight the challenges posed by RT positioning on an unenhanced CT scan. 3. describe, illustrate and identify the essential anatomical landmarks that underpin the regional nodal levels, including: the subclavian vein, arch of the subclavian artery, internal carotid artery, differences in internal mammary/thoracic arterial origins, medial perforating mammarian and lateral thoracic arteries; musculature (scalenus anterior and pectoralis major and minor); and bones (clavicle, lateral margin of the first rib, fourth rib and humeral head). 4. offer an approach to applying borders to each lymph node level based on the essential anatomical landmarks. 5. Illustrate relevant anatomical variants. Conclusion: This practical guide will enhance understanding, and implementation, of the ESTRO guidance and promote collaboration between radiologists and radiation oncologists to improve patient care.

Database: EMBASE

12. Review of the three-field techniques in breast cancer radiotherapy.

Author(s): Kagkiouzis, John; Platoni, Kalliopi; Kantzou, Ioanna; Dilvoi, Maria; Patatoukas, George; Kypraiou, Efrosyni; Efstathopoulos, Efstathios; Sarris, George; Trogkanis, Nikolaos; Kouloulias, Vassilis

Source: Journal of B.U.ON. : official journal of the Balkan Union of Oncology; 2017; vol. 22 (no. 3); p. 599-605

Publication Date: 2017

Publication Type(s): Journal Article

PubMedID: 28730762

Abstract: Breast cancer is often treated with radiotherapy (RT), with two opposing tangential fields. When indicated, supraclavicular lymph nodes have to be irradiated, and a third anterior field is applied. The junction region has the potential to be over or underdosed. To overcome this problem, many techniques have been proposed. A literature review of 3 Dimensional Conformal RT (3D CRT) and older 3-field techniques was carried out. Intensity Modulated RT (IMRT) techniques are also briefly discussed. Techniques are categorized, few characteristic examples are presented and a comparison is attempted. Three-field techniques can be divided in monoisocentric and two-isocentric. Two-isocentric techniques can be further divided in full field and half field techniques. Monoisocentric techniques show certain great advantages over two-isocentric techniques. However, they are not always applicable and they require extra caution as they are characterized by high dose gradient in the junction region. IMRT has been proved to give better dosimetric results. Three-field matching is a complicated procedure, with potential of over or undredosage in the junction region. Many techniques have been proposed, each with advantages and disadvantages. Among them, monoisocentric techniques, when carefully applied, are the ideal choice, provided IMRT facility is not available. Otherwise, a two-isocentric half beam technique is recommended.

Database: Medline

13. VMAT radiation-induced nausea and vomiting in adjuvant breast cancer radiotherapy: The incidental effect of low-dose bath exposure

Author(s): Lazzari G.; Silvano G.; Terlizzi A.; Leo M.G.

Source: Clinical and Translational Radiation Oncology; Dec 2017; vol. 7 ; p. 43-48

Publication Date: Dec 2017

Publication Type(s): Article

Available at Clinical and Translational Radiation Oncology - from PubMed Central

Abstract: Background and purpose To investigate the hypothesis on low-dose bath exposure related to radiation-induced nausea and vomiting (RINV) in adjuvant breast volumetric modulated arch therapy (VMAT). Methods and materials A total of 106 consecutive breast cancer patients (pts) treated with adjuvant radiotherapy (RT) with VMAT from January 2013 to May 2016 were evaluated retrospectively. For each pt, a planning CT was reimported and the coeliac plexus and gastroesophageal junction with gastric mouth (GEJCPs) were contoured as a new organ at risk (OAR) in the upper abdominal area. RINV was associated with Dmax and Dmean to GEJCPs. Univariate analysis with chi2, t-test, and Pearson's covariance was used for statistical analysis. Results Of 106 pts, 64% complained of acute RINV according to the Common Terminology Criteria for Adverse Events (CTCAE) version 4.03. RINV was related to Dmax > 10 Gy and Dmean > 3 Gy to GEJCPs (P < 0.005). The radiation breast side and planning target volume (PTV) correlated with RINV. Conclusions RINV in VMAT breast radiotherapy could be a new emerging acute side effect due to a low dose bath to upper abdominal structures such as the GEJCPs. A Dmax < 10 Gy and Dmean < 3 Gy to GEJCPs should be constrained in VMAT planning to minimize RINV risk in breast radiotherapy.Copyright © 2017 The Authors

Database: EMBASE

14. The robustness of dual isocenter VMAT radiation therapy for bilateral lymph node positive breast cancer

Author(s): Boman E.; Rossi M.; Kapanen M.

Source: Physica Medica; Dec 2017; vol. 44 ; p. 11-17

Publication Date: Dec 2017

Publication Type(s): Article

PubMedID: 29254586

Abstract: Purpose To investigate the use of dual isocenters for VMAT planning in patients with lymph node positive synchronous bilateral breast cancer (BBC) compared to a single isocenter option. Methods Treatment plans of 11 patients with lymph node positive BBC were retrospectively analyzed using two different VMAT planning techniques: dual-isocenter split-arc VMAT plans (Iso2) were compared with mono-isocenter VMAT plans (Iso1). For Iso2 plans, PTV dose was investigated after introducing +/-2 and +/-5 mm couch shift errors between the two isocenters in the lateral, longitudinal and vertical direction. Results For both techniques the planning aims for PTV coverage and OARs were met. The mean dose for the bilateral lungs and heart was reduced from 11.3 Gy and 3.8 Gy to 10.9 Gy (p <.05) and 3.6 Gy (p <.05), respectively, for Iso2 plans when compared to Iso1 plans. Positive statistically significant correlation (rho = 0.76, p =.006) was found between PTV volume and D2ccPTV for Iso1 plans. No clinically significant change was seen in the D98CTV or D2ccPTV after the 2 and 5 mm errors were introduced between isocenters for Iso2 plans. Conclusions The split arc method was shown to be a feasible treatment technique in the case of synchronous BBC for both mono and dual isocenter techniques. The dose parameters were slightly favoring dual-isocenter option instead of mono-isocenter. The dual-isocenter method was shown to be a robust treatment option in the presence of <=5 mm errors in the shifts between the two isocenters.

Database: EMBASE

15. Comparison of cardiac and lung doses for breast cancer patients with free breathing and deep inspiration breath hold technique in 3 dimensional conformal radiotherapy - A dosimetric study

Author(s): Mani K.R.; Poudel S.; Das K.J.M.

Source: Polish Journal of Medical Physics and Engineering; Dec 2017; vol. 23 (no. 4); p. 109-114

Publication Date: Dec 2017

Publication Type(s): Article

Available at Polish Journal of Medical Physics and Engineering - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Polish Journal of Medical Physics and Engineering - from International DOI Foundation

Abstract: Purpose: To investigate the cardio-pulmonary doses between Deep Inspiration Breath Hold (DIBH) and Free Breathing (FB) technique in left sided breast irradiation. Materials & Methods: DIBH CT and FB CT were acquired for 10 left sided breast patients who underwent whole breast irradiation with or without nodal irradiation. Three fields single isocenter technique were used for patients with node positive patients along with two tangential conformal fields whereas only two tangential fields were used in node negative patients. All the critical structures like lungs, heart, esophagus, thyroid, etc., were delineated in both DIBH and FB scan. Both DIBH and FB scans were fused with the Dicom origin as they were acquired with the same Dicom coordinates. Plans were created in the DIBH scan for a dose range between 50 Gy in 25 fractions. Critical structures doses were recorded from the Dose Volume Histogram for both the DIBH and FB data set for evaluation. Results: The average mean heart dose in DIBH vs FB was 13.18 Gy vs 6.97 Gy, (p = 0.0063) significantly with DIBH as compared to FB technique. The relative reduction in average mean heart dose was 47.12%. The relative V5 reduced by 14.70% (i.e. 34.42% vs 19.72%, p = 0.0080), V10 reduced by 13.83% (i.e. 27.79 % vs 13.96%, p = 0.0073). V20 reduced by 13.19% (i.e. 24.54 % vs 11.35%, p = 0.0069), V30 reduced by 12.38% (i.e. 22.27 % vs 9.89 %, p = 0.0073) significantly with DIBH as compared to FB. The average mean left lung dose reduced marginally by 1.43 Gy (13.73 Gy vs 12.30 Gy, p = 0.4599) but insignificantly with DIBH as compared to FB. Other left lung parameters (V5, V10, V20 and V30) shows marginal decreases in DIBH plans compare to FB plans. Conclusion: DIBH shows a substantial reduction of cardiac doses but slight and insignificant reduction of pulmonary doses as compared with FB technique. Using the simple DIBH technique, we can effectively reduce the cardiac morbidity and at the same time radiation induced lung pneumonitis is unlikely to increase.

Database: EMBASE

16. Techniques d'irradiation mammaire complexe: radiotherapie conformationelle tridimensionnelle mono-isocentrique et nomotherapie helicoidaleTechnique of complex mammary irradiation: Mono-isocentric 3D conformational radiotherapy and helical tomotherapy

Author(s): Vandendorpe B.; Guilbert P.; Nguyen T.D.; Servagi Vernat S.; Champagne C.; Antoni T.; Gaillot-Petit N.

Source: Cancer/Radiotherapie; Dec 2017; vol. 21 (no. 8); p. 741-748

Publication Date: Dec 2017

Publication Type(s): Article

PubMedID: 28693911

Abstract: Purpose To evaluate the dosimetric contribution of helical tomotherapy for breast cancers compared with conformal radiotherapy in mono-isocentric technique. Patients and method For 23 patients, the dosimetric results in mono-isocentric 3D conformational radiotherapy did not satisfy the constraints either of target volumes nor organs at risk. A prospective dosimetric comparison between mono-isocentric 3D conformational radiotherapy and helical tomotherapy was therefore carried out. Results The use of helical tomotherapy showed a benefit in these 23 patients, with either an improvement in the conformity index or homogeneity, but with an increase in low doses. Of the 23 patients, two had pectus excavatum, five had past thoracic irradiation and two required bilateral irradiation. The other 14 patients had a combination of morphology and/or indication of lymph node irradiation. For these patients, helical tomotherapy was therefore preferred to mono-isocentric 3D conformational radiotherapy. Conclusions Tomotherapy appears to provide better homogeneity and tumour coverage. This technique of irradiation may be justified in the case of morphological situations such as pectus exavatum and in complex clinical situations. In other cases, conformal radiotherapy in mono-isocentric technique remains to be favoured.

Database: EMBASE

17. Patterns of locoregional failure in women with early stage breast cancer treated by whole breast radiation therapy in the lateral isocentric decubitus position: Large-scale single center experience

Author(s): Xu H.; Bazire L.; Fourquet A.; Bronsart E.; Costa E.; Khrili S.; Logerot C.; Belshi A.; Kirova Y.M.

Source: International Journal of Radiation Oncology Biology Physics; Oct 2017; vol. 99 (no. 2)

Publication Date: Oct 2017

Publication Type(s): Conference Abstract

Available at International Journal of Radiation Oncology*Biology*Physics - from ScienceDirect

Abstract: Purpose/Objective(s): To evaluate loco-regional control and describe the patterns of failure in patients (pts) with breast cancer irradiated by previously published whole breast radiotherapy (WBRT) in the isocentric lateral decubitus position (ILD). Purpose/Objective(s): We studied 832 consecutive female patients with early stage BC treated by breast conservative surgery (BCS) followed by 3D conformal WBRT-ILD between 2006 and 2010 in our department. All patients who experienced loco-regional recurrence have been studied. 5-year RFS and OS rate were calculated. Mapping patterns of regional recurrences was also performed. Results: Among the 832 women included 51% of the patients presented left side BC and 49% right. The median age was 61.5 years (range, 29-90). Different types of fractionation schemes were used: 66 Gy in 33 fractions (fr) (46.5%), 50Gy/25 fr (17.9%), 40Gy/15 fr or 41.6Gy/13 fr (26.1%) and 30Gy/5 fr (9.5%). With the median follow-up of 6.4 years, the median overall survival had not been reached at the end of follow-up. Analysis of recurrence-free interval revealed only 36 cases of locoregional recurrence with no association with dose fractionation (p=0.2). Neither overall survival nor relapse free interval was impacted by the radiotherapy dose and fractionation. In the population of 36 pts, there were 28 pts (77.8%),presented with "in breast" local recurrences (LR), in 2 cases (5.6%) there were LR associated with regional lymph node recurrence (RLNR), and in 6 cases (16.6%) we observed RLNR alone (in non-irradiated areas). The median latency recurrence time was 50 months. Complete cartography of the recurrences was realized and in the most cases the LR was situated close to the initial tumor bed. Conclusion: The presented results are excellent in terms of LR rate. Further careful follow-up and careful registration of the recurrences is needed to improve their understanding.

Database: EMBASE

18. Prone positioning in the treatment of the whole breast and regional lymphatics using a mono-isocentric four field radiation technique: A dosimetric comparison

Author(s): Waddle M.R.; Magalhaes W.L.; Miller D.; Herchko S.; Tzou K.S.; Peterson J.L.; Vallow L.A.

Source: International Journal of Radiation Oncology Biology Physics; Oct 2017; vol. 99 (no. 2)

Publication Date: Oct 2017

Publication Type(s): Conference Abstract

Available at International Journal of Radiation Oncology*Biology*Physics - from ScienceDirect

Abstract: Purpose/Objective(s): Prone positioning for irradiation of the whole breast only has been shown to offer superior dose distributions and reduced radiation dose to the heart and lungs in node negative women. It is unclear whether a benefit exists in treating the whole breast and regional lymph nodes in a prone position; no method has been described for treating at risk supraclavicular (SCV) and axillary nodal regions in the prone position. We present a dosimetric comparison of breast radiation using a four field mono-isocentric technique to treat the whole breast, axillary, and supraclavicular regions in the supine and prone position. Purpose/Objective(s): Ten patients were simulated in supine and prone positions using a modified prone breast board. The ipsilateral breast, ipsilateral lung, heart, axillary, and SCV lymph node regions were contoured in accordance with Radiation Therapy Oncology Group (RTOG) guidelines. A four field beam arrangement was used with opposed tangents, supraclavicular field, and axillary boost field. The breast volume receiving 95% of prescription dose, nodal volumes receiving 90% prescription dose, lung volume receiving 20 Gray (V20), and mean heart dose were compared between the supine and prone radiation plans. Results: The target volume coverage was similar between the two groups with an average breast coverage of 94.0% and 93.1% (p=0.6), an average axillary node coverage of 92.6% and 88.3% (p=0.3), and an average SCV node coverage of 95.2% and 94.3% (p=0.7) in the supine and prone four field groups, respectively (Table 1). Ipsilateral lung V20 was significantly improved in the prone four field group at 10.2% versus 21.3% (p<0.001) in the supine group. Mean heart dose was lower on average for the prone position, but the difference was non-significant. Conclusion: To our knowledge, this is the first dosimetric comparison of treatment of the whole breast and regional nodes using a prone four field technique. This study demonstrates a significant decrease in lung V20 by approximately 50% with prone treatment, while maintaining comparable breast and nodal coverage. Our findings indicate that treatment of the breast and nodal regions in the prone position is dosimetrically feasible and may reduce lung toxicity for women treated with radiation for breast cancer. Dosimetric values for RTOG defined target and organ at risk volumes.

Database: EMBASE

19. Five-field IMRT class solutions and dosimetric planning guidelines for implementing accelerated partial breast irradiation.

Author(s): Quirk, Sarah; Grendarova, Petra; Roumeliotis, Michael

Source: Practical radiation oncology; Sep 2017

Publication Date: Sep 2017

Publication Type(s): Journal Article

PubMedID: 29141779

Abstract:PURPOSEA comprehensive set of planning guidelines was developed to aid in achieving reproducible dosimetric results for external beam accelerated partial breast irradiation (APBI). The methodology for the development of class solutions for dosimetric planning of the APBI technique, including dose constraint recommendations, is presented for target coverage and conformity as well

as normal tissues.METHODS AND MATERIALSA conservative patient setup was simulated on a linear accelerator, and a comprehensive arrangement of gantry and couch angles was measured for clearance. This provided the foundation for available beam arrangements to develop reproducible and conformal 5-field intensity modulated radiation therapy partial breast plans. Forty patients were planned. Patient plans were assessed according to anatomy specific features, such as laterality and seroma location within the breast.RESULTSClearance tables are presented to give permissible gantry and couch orientations according to measurements facilitated by patient simulation. Beam arrangement class solutions are presented for left- and right-sided APBI patients. Dosimetric recommendations are made based on the results of 40 patient plans. The median and range, describing target coverage and target conformity, are reported, as are normal tissue constraints for ipsilateral lung, ipsilateral breast, heart, liver, and contralateral breast. In all cases, the dose recommendations were at least as strict as multi-institutional APBI trials. In the case of ipsilateral lung and ipsilateral breast, the planning recommendations are more stringent.CONCLUSIONSAPBI using a 5-field intensity modulated radiation therapy technique was comprehensively developed and evaluated to provide recommendations yielding highly conformal and reproducible treatment plans. This provides a clear method to implement external beam APBI planning and delivery.

Database: Medline

20. Field-Specific Intensity-modulated Proton Therapy Optimization Technique for Breast Cancer Patients with Tissue Expanders Containing Metal Ports.

Author(s): Kirk, Maura; Freedman, Gary; Ostrander, Thorsten; Dong, Lei

Source: Cureus; Sep 2017; vol. 9 (no. 9); p. e1698

Publication Date: Sep 2017

Publication Type(s): Journal Article

PubMedID: 29159005

Available at Cureus - from Europe PubMed Central - Open Access

Available at Cureus - from PubMed Central

Abstract: This report aims to propose and present an evaluation of a robust pencil beam scanning proton multi-field optimized treatment planning technique for postmastectomy radiation of breast cancer patients with implanted tissue expanders containing an internal metal port. Field-specific split targets were created for optimization to prevent spots from traveling through the metal port, while providing uniform coverage of the target with the use of a multi-field intensity modulated optimization approach. Two beam angles were strategically selected to provide complementary target coverage and plan robustness. The plan was compared with an independently developed photon plan and evaluated for robustness with respect to isocenter shifts, range shifts, and variation of the water-equivalent thickness of the port. The proton plan resulted in clinically acceptable target coverage and dosage to neighboring normal tissues. The D95% coverage was 95.3% in the nominal proton plan, with a worst-case coverage of 90.1% (when considering 0.3 cm isocenter shifts combined with 3.5% range uncertainty), and the coverage varied less than 1% under a hypothetically extreme variation of the port density. The proton plan had improved dose homogeneity compared with the photon plan, and reduced ipsilateral lung and mean heart doses. We demonstrated that a practical, field-specific intensity-modulated proton therapy (IMPT) optimization technique can be used to deal with the challenge of metal port in breast cancer patients with tissue expanders. The resulting proton plan has superior dosimetric characteristics over the best-case scenario photon plan, and is also robust to setup and proton range uncertainties.

Database: Medline

21. CT images and radiotherapy treatment planning of patients with breast cancer: A dataset.

Author(s): Rezaei, Mohammad; Mohammadbeigi, Ahmad; Khoshgard, Karim; Haghparast, Abbas

Source: Data in brief; Aug 2017; vol. 13 ; p. 390-395

Publication Date: Aug 2017

Publication Type(s): Journal Article

PubMedID: 28664175

Available at Data in Brief - from Europe PubMed Central - Open Access

Available at Data in Brief - from PubMed Central

Abstract: The data presented here were originally collected for the research project "CT-Scan processing and analysis in patient with breast cancer after radiotherapy". Also, it reported in our study "Prediction of Lung Tissue Damage by Evaluating Clinical and Dosimetric Parameters in Breast Cancer Patients" (Hasanabdali et al., 2016) [1]. This article describes and directly links to 52 subjects referred to Mahdieh Oncology and Radiotherapy Center from February to August 2015. Treatment planning was done for delivering 50 Gy dose to PTV in 25 fractions. the lungs and heart objects were extracted from CT images along with compliance Dose plan. Dose-volume histogram (DVH) and Dose-mass histogram (DMH) extracted using CT images and dose plan matrix. Moreover, the complete clinical and dosimetric specifications of subjects is attached.

Database: Medline

22. Whole breast radiotherapy in the lateral isocentric lateral decubitus position: Long-term efficacy and toxicity results

Author(s): Bronsart E.; Xu H.P.; Bazire L.; Chilles A.; Costa E.; Logerot C.; Campana F.; Fourquet A.; Kirova Y.M.; Dureau S.; Berger F.; Falcou M.-C.

Source: Radiotherapy and Oncology; Aug 2017; vol. 124 (no. 2); p. 214-219

Publication Date: Aug 2017

Publication Type(s): Article

PubMedID: 28734546

Abstract: Purpose To evaluate previously published whole breast radiotherapy (WBRT) using ILD (isocentring lateral decubitus) technique in terms of toxicity and efficacy. Materials and methods From 2006 to 2010, 832 female patients with early-stage breast cancer (BC) treated by conservative surgery underwent 3D-conformal WBRT-ILD at Institut Curie. The acute toxicity of treatment was evaluated weekly and the late toxicity (6 months and later after the treatment) was evaluated every 6 months till the 5th year after the end of the radiotherapy using NCI CTC v3.0 scale. Dosimetric study was performed to analyse the mean cardiac dose and the mean homolateral and contralateral lung doses. Results The median follow up was 6.4 years. The median age was 61.5 years (range, 29-90), and median body mass index (BMI) was 26.3. Fifty one percent of the patients presented left sided BC and 49% right sided. Different type of fractions were used: 46.5% of pts.: 50 (breast) + 16 Gy (boost) in 33 fractions (fr), in 17.9%-50 Gy/25 fr, in 26.1%-40/15 fr or 41.6 Gy/13 fr and in 9.5%: 30 Gy/5 fr. Acute dermatitis was present in 93% with a median of apparition of 4 weeks, and only 2,8% grade 3. In multivariate analysis, the cup size had significant influence (p = 0.0004) and the fractionation had a significative influence (p = 0.0001). In the all patients' population, 94.1% of cases had no skin toxicity at 1 year. No cardiac or pulmonary toxicity was reported. The median overall survival had not been reached at the end of follow-up. We observed 36 (3.6%) recurrences, as

following: 30 local (breast) recurrences, 4 lymph node (LN), and 2 pts experiencing both. Conclusion Whole breast radiotherapy in the lateral decubitus position provides excellent results in terms of local control and survival. ILD is well tolerated with very good acute toxicity profile. No cardiac or pulmonary toxicity were observed in this study. Longer follow-up is needed to confirm these results.

Database: EMBASE

23. Volumetric Modulated Arc Therapy followed by bilateral mastectomy for treating synchronous cancer and sarcoma - A rare case report

Author(s): Galecki J.; Beczkowska K.; Mezenski P.

Source: Nowotwory; Aug 2017; vol. 67 (no. 1); p. 48-53

Publication Date: Aug 2017

Publication Type(s): Article

Abstract: Purpose. Bilateral postmastectomy irradiation (BPMI) poses a challenge to radiotherapists. The dificulty lies whenever targets are large, irregular and lying at different depths. When breathing movements occur it is very hard to obtain homogenous dosing on such targets and also to not exceed those doses acceptable for at-risk organs, particularly the lungs and heart. The presented study is an example of using a single isocenter Volumetric Modulated Arc Therapy (VMAT) technique for a BPMI case. Materials and methods. We report the case of a 66-year-old woman with simultaneous malignant sarcoma of the right breast and an invasive ductal carcinoma of the left breast. After modified radical mastectomy of the left breast and simple mastectomy of the right breast, the patient underwent adjuvant irradiation of the bilateral chest wall and left axillary and supraclavicular nodes region. Planning Target Volumes (PTV) and organs at risk (OAR) were delineated on CT scans. A single isocenter VMAT plan was created. The radiotherapy consisted of 50 Gy delivered in 2 Gy per fraction to the left side and 56.5 Gy delivered in 2.25 Gy per fraction to the right side in 25 fractions, five times a week over 5 weeks. Results. The left and right CTV (Clinical Target Volume) received 90% of the prescribed dose in 100% of the CTV volume. The mean heart dose was 14.4 Gy and V25 for the heart was 8.9%. The mean lung dose was 16.6 Gy and the V20 for both lungs was 28.3%. The dose to the anterior wall area of the heart was exceeded according to established constraints, but was accepted. One session of irradiation lasted about four minutes during which the patient received 595 monitor units. The treatment was carried out without interruption and complications. The early and late skin reaction was assessed as being second grade. After one year of follow-up, the patient did not present any serious side effects or recurrence. Conclusions. Synchronous irradiation of both sides of the chest wall after bilateral mastectomy with a single isocenter VMAT technique is possible and well tolerated.

Database: EMBASE

24. The impact of imaging modality (CT vs MRI) and patient position (supine vs prone) on tangential whole breast radiation therapy planning.

Author(s): Dundas, Kylie; Pogson, Elise M; Batumalai, Vikneswary; Delaney, Geoff P; Boxer, Miriam M; Yap, Mei Ling; Ahern, Verity; Chan, Christine; David, Steven; Dimigen, Marion; Harvey, Jennifer A; Koh, Eng-Siew; Lim, Karen; Papadatos, George; Lazarus, Elizabeth; Descellar, Joseph; Metcalfe, Peter; Holloway, Lois

Source: Practical radiation oncology; Jul 2017

Publication Date: Jul 2017

Publication Type(s): Journal Article

PubMedID: 28993138

Abstract:PURPOSEThe purpose of this study was to evaluate the impact of magnetic resonance imaging (MRI) versus computed tomography (CT)-derived planning target volumes (PTVs), in both supine and prone positions, for whole breast (WB) radiation therapy.METHODS AND MATERIALSFour WB radiation therapy plans were generated for 28 patients in which PTVs were generated based on CT or MRI data alone in both supine and prone positions. A 6-MV tangential intensity modulated radiation therapy technique was used, with plans designated as ideal, acceptable, or noncompliant. Dose metrics for PTVs and organs at risk were compared to analyze any differences based on imaging modality (CT vs MRI) or patient position (supine vs prone).RESULTSWith respect to imaging modality 2/11 whole breast planning target volume (WB_PTV) dose metrics (percentage of PTV receiving 90% and 110% of prescribed dose) displayed statistically significant differences; however, these differences did not alter the average plan compliance rank. With respect to patient positioning, the odds of having an ideal plan versus a noncompliant plan were higher for the supine position compared with the prone position (P = .026). The minimum distance between the seroma cavity planning target volume (SC_PTV) and the chest wall was increased with prone positioning (P < .001, supine and prone values 1.1 mm and 8.7 mm, respectively). Heart volume was greater in the supine position (P = .005). Heart doses were lower in the supine position than prone (P < .01, mean doses 3.4 ± 1.55 Gy vs 4.4 ± 1.13 Gy for supine vs prone, respectively). Mean lung doses met ideal dose constraints in both positions, but were best spared in the prone position. The contralateral breast maximum dose to 1cc (D1cc) showed significantly lower doses in the supine position (P < .001, 4.64 Gy vs 9.51 Gy).CONCLUSIONSPlanning with PTVs generated from MRI data showed no clinically significant differences from planning with PTVs generated from CT with respect to PTV and doses to organs at risk. Prone positioning within this study reduced mean lung dose and whole heart volumes but increased mean heart and contralateral breast doses compared with supine.

Database: Medline

25. Iterative dataset optimization in automated planning: Implementation for breast and rectal cancer radiotherapy.

Author(s): Fan, Jiawei; Wang, Jiazhou; Zhang, Zhen; Hu, Weigang

Source: Medical physics; Jun 2017; vol. 44 (no. 6); p. 2515-2531

Publication Date: Jun 2017

Publication Type(s): Journal Article

PubMedID: 28339103

Abstract:PURPOSETo develop a new automated treatment planning solution for breast and rectal cancer radiotherapy.METHODSThe automated treatment planning solution developed in this study includes selection of the iterative optimized training dataset, dose volume histogram (DVH) prediction for the organs at risk (OARs), and automatic generation of clinically acceptable treatment plans. The iterative optimized training dataset is selected by an iterative optimization from 40 treatment plans for left-breast and rectal cancer patients who received radiation therapy. A two-dimensional kernel density estimation algorithm (noted as two parameters KDE) which incorporated two predictive features was implemented to produce the predicted DVHs. Finally, 10 additional new left-breast treatment plans are re-planned using the Pinnacle3 Auto-Planning (AP) module (version 9.10, Philips Medical Systems) with the objective functions derived from the predicted DVH curves. Automatically generated re-optimized treatment plans are compared with the original manually optimized plans.RESULTSBy combining the iterative optimized training dataset methodology and two parameters KDE prediction algorithm, our proposed automated planning strategy improves the accuracy of the DVH prediction. The automatically generated treatment plans using the dose derived

from the predicted DVHs can achieve better dose sparing for some OARs without compromising other metrics of plan quality.CONCLUSIONSThe proposed new automated treatment planning solution can be used to efficiently evaluate and improve the quality and consistency of the treatment plans for intensity-modulated breast and rectal cancer radiation therapy.

Database: Medline

26. Automatic treatment planning for whole breast radiation therapy using hybrid IMRT

Author(s): Guo B.; Shah C.; Xia P.

Source: Medical Physics; Jun 2017; vol. 44 (no. 6); p. 2905-2906

Publication Date: Jun 2017

Publication Type(s): Conference Abstract

Abstract: Purpose: To introduce an automatic treatment planning technique for whole breast radiation therapy using hybrid IMRT. Methods: MIM was used for atlas based segmentation of normal structures and identifying landmarks (wires and/or physician drawn boundaries) for beam placement. A MATLAB program was developed and integrated in MIM to setup tangential beams using the landmarks and generate Pinnacle Script for auto planning using hybrid IMRT. Energies of the beams were determined by the maximal separation and weightings of the beams were optimized using auto selected points within the breast. The hybrid IMRT plan contains a 3D plan prescribed to the maximum point dose and a step and shoot IMRT plan to compensate for the missing dose in the target while minimizing the doses to lungs and the heart. The 3D and IMRT plans were then merged to create a segmented tangential plan. The auto plans were compared with clinical plans for beam angles, MUs, target coverage, hot spots, and lung and heart doses for five patients. Results: Auto planning produces similar beam setup with clinical plans: gantry and collimator angles were within 2 degrees. MUs of open beams were within 5%. MUs of segments were on average 4 times higher for auto plans. The increased modulation allowed for better coverage of the target (on average, PTV V95 increased from 92% to 95%, tumor bed D100 increased from 95% to 98%), less hot spots (PTV V105 decreased from 16% to 7%) and less lung and heart dose (ipsilateral Lung V20 reduced from 13% to 11% and heart mean dose reduced from 1.3 Gy to 1.1 Gy). Conclusion: A fully automated treatment planning technique was developed for whole breast radiation therapy using hybrid IMRT. This technique gives equivalent or better plan quality compared with clinical plans.

Database: EMBASE

27. Using robust optimization in raystation to achieve flash in breast VMAT plans

Author(s): Kalavagunta C.; Lasio G.

Source: Medical Physics; Jun 2017; vol. 44 (no. 6); p. 2906-2907

Publication Date: Jun 2017

Publication Type(s): Conference Abstract

Abstract: Purpose: In this study we evaluate the Robust Optimization (RO) functionality in Raystation (RS) treatment planning system to achieve Breast VMAT (Volumetric Modulated Arc Therapy) plan setup uncertainty robustness. Methods: Five advanced stage breast patients were randomly selected for this study. The prescription dose ranged from 45-50.4 Gy in 25-28 fractions (1.8-2 Gy/fraction). Dosimetric planning goals were determined from normal tissue tolerances and from the clinical experience of radiation oncologists at our clinic. While a flash region is typically employed to account

for respiration induced motion or for anatomical changes during IMRT radiation therapy of the breast, in VMAT planning flash is not straightforward to achieve. To assess the efficacy of RO we created VMAT and Robust-VMAT treatment plans for each patient. A setup uncertainty of 1.5 cm for PTV and OARs was used as robustness setting in the anterior and left/right direction depending on the tumor site. To assess the robustness of the plan the isocenter was shifted by 5 mm in the posterior and left/right direction and the resulting perturbed dose was compared to the nominal plan, optimized without RO. VMAT and Robust-VMAT plans were compared on the basis of dosimetric end points, target coverage (D95%) and OAR doses. Results: While the presence of skin flash was seen on all robust plans, only 63% of the patients in the study required a robust plan for final delivery. RO plans showed good robustness to 5 mm shift with as little as 0.2% change in D98. Conclusion: A robust optimization method that introduces "skin flash" for breast VMAT plans and maximizes the probability of satisfying the planning criteria in the presence of respiratory motion and setup uncertainty has been evaluated. In all cases the perturbed robust plans led to clinically acceptable target coverage and the presence of skin flash.

Database: EMBASE

28. A simple predictor for V105 in breast tangential treatment planning

Author(s): Chen H.; Kim J.; Carlson D.; Deng J.; Nath R.; Chen Z.

Source: Medical Physics; Jun 2017; vol. 44 (no. 6); p. 3000

Publication Date: Jun 2017

Publication Type(s): Conference Abstract

Abstract: Purpose: The purpose of this study is to demonstrate the feasibility of knowledge-based prediction of V105 for breast tangential treatment planning. Methods: 45 previously treated breast conserving radiotherapy cases (20 right supine, 14 Left supine, and 11 prone) were used in this study (all plans used tangential fields and the field-in-field technique.) Energies used for these plans were 6MV, or 6MV mixed with 10MV or 15MV. PTV coverage was normalized to a 95% prescription dose that covers 95% of the PTV volume. The correlations between V105 and four patient-specific geometric parameters (PTV Volume (PV), irradiated Volume (IV), chest wall separation (CWS), and separation at half breast height (HHS)) were analyzed, respectively, to build a prediction model for V105. Suboptimal plans identified by the developed knowledge-based V105 prediction model were re-planned for model validation. Results: Since breast volume and shape are different for each patient, the HHS may vary when the PV or IV remains same. We found that the V105 significantly correlated with the HHS separation($r = 0.8$, $p < 0.01$). The Knowledge-based V105 prediction model based on this patient cohort being: "if HHS < 17.5 cm, then V105 <= 5% is achievable". 3 suboptimal plans were identified, which the model predicted that hot spot of V105 could be lowered to less than 5%. Re-plans were performed and verified that V105 < 5% was achievable for the suboptimal plans, by using optimal energies and/or optimal MLC shapes. Conclusion: This study demonstrated the knowledge-based prediction of V105 for breast tangential planning is feasible. A simple predicator for V105 serves as a quality control tool to identify the suboptimal plans. Subsequent re-planning demonstrated improved plan quality regarding the hot spot V105. The model can be further refined for other breast OAR dose matrix predictions, not only limited for V105.

Database: EMBASE

29. Inverse planning for breast interstitial brachytherapy. Introducing a new anatomy specific breast interstitial template (ASBIT)

Author(s): Karagiannis E.; Leczynski A.; Tselis N.; Psanis E.; Steckenreiter O.; Milickovic N.; Ferentinos K.; Zamboglou N.; Strouthos I.; Baltas D.

Source: Strahlentherapie und Onkologie; Jun 2017; vol. 193 (no. 1)

Publication Date: Jun 2017

Publication Type(s): Conference Abstract

Available at Strahlentherapie und Onkologie - from International DOI Foundation

Abstract: Purpose: Primarily to develop an innovative, one-size-fits-all, patient's anatomy specific, US/CT/MRI-compatible template for breast interstitial brachytherapy treatment (inverse planning-inverse implanting) and secondarily to evaluate its dosimetric results. Methods and Materials: A custom template based on a thoracic cage surface reconstruction from 100 consecutive female patients' radiotherapy- planning CT scans, was designed. Three methods for the uniform distribution of catheter insertion holes (grid I, II, III) for needle guidance were tested and evaluated. CT-guided, hybrid inverse planning and optimization (HIPO)-based implantations and brachytherapy plans (TG-43 protocol), using three custom anthropomorphic breast phantom models of different sizes (breast cup: AA, C, E), embedded with eight polystyrene masses, simulating eight breast surgical cavities (SC) with a diameter range of 15-35 mm, were used for the validation of the template. The planning tumor volumes (PTVs) were created from a nonisotropic geometrical extension of the SC, by taking into account hypothetical, random generated, free resection margins (range: 1-12 mm) to a total tumor bed (TB) to PTV margin of 20 mm. The PTV ranged from 40.5 ml to 147.4 ml. Eight independent complete procedures with a given number of catheters (mean catheter number: 18, range 15-20) that is routinely used in clinical practice (grid I) were performed to test the accuracy of the procedure. Consequently, 168 virtual procedures with 8, 10, 12, 14, 16, 18 and 20 catheters (grid I, II, III) were executed to determine the optimal number and position of catheters for every grid. The dose volume histogram (DVH) parameters for the PTVs were calculated. Results: The custom template fits on the patient's anatomy and provides high accuracy of the preplanned catheter tracks in comparison to post-implantation image data (mean distance of preplanned catheter from actual catheter: 0.82 mm, range 0-2 mm) as well as excellent dosimetric results regardless of the breast size, the PTV size, or the grid method. The mean V90, V100, V150, V200 were 98.23%, 94.75%, 23.57%, 7.63% for the grid I, 97.78%, 94.05%, 23.41%, 7.66% for the grid II, 98.19%, 94.74%, 23.61%, 7.72%, respectively. The mean D90 and D100 were 108% and 78.78% for the grid I, 107.27% and 77.30% for the grid II, 108.38% and 77.64% for the grid III respectively. The mean COIN was 0.83, 0.82, 0.82, for the grid I, grid II, grid III respectively. The proposed approach was able to reduce the number of catheters down to 8 while fulfilling the international guidelines. Conclusions: Use of the new Anatomy Specific Breast Interstitial Template (ASBIT) as part of the proposed implanting and radiation treatment delivery technique is feasible and has the potential to improve the procedure accuracy, time and dosimetric outcome while enabling the user independent implementation of brachytherapy procedures.

Database: EMBASE

30. Outcomes of 3D conformal planning of whole breast radiotherapy following breast conserving surgery

Author(s): De Paiva R.; Mark F.; Fraser O.; Dubey S.

Source: Clinical Oncology; Jun 2017; vol. 29 (no. 6)

Publication Date: Jun 2017

Publication Type(s): Conference Abstract

Abstract: Purpose: 3D conformal radiotherapy planning using the field in field (FiF) technique has been in use in our department since 2009 to deliver whole breast radiotherapy following breast conservation surgery (BCS). This retrospective study assessed the rates of ipsilateral breast cancer recurrence and dosimetric data with the FiF technique Methods: Patients treated with conformal whole breast radiotherapy following BCS between January 2010 and December 2011 were identified from the local radiotherapy database and hospital records were accessed to record the relevant information For conformal radiotherapy, whole breast and high risk CTV were defined together with respective PTVs with a margin of 5 mm. The heart and lung volumes were also defined on the planning system Results: 219 patients were included in the study. The mean follow-up period was 67.8 months. The mean age of patients was 59.3 years. The tumour margin was clear by >2 mm in 75.1% of cases. The adjuvant hormonal treatment was received by 77.1% and chemotherapy by 32.9% of patients. All patients received conformal FiF breast radiotherapy to a dose of 40 Gy in 15 fractions over 3 weeks. The median number of radiotherapy treatment fields was 4. The mean whole breast PTV (PTVWB) covered by the 90% isodose was 94.97% with a mean Dmax dose of 106.6%. The mean heart dose for left-sided treatment was 1.19 Gy. The mean ipsilateral lung volume covered by 12 Gy was 9.7%. The ipsilateral breast cancer recurrence was detected in 7 patients (3.19%). On multivariate Cox regression analysis, HER2 status, T stage, age and dose covering PTVWB were statistically associated with increased risk of ipsilateral breast relapse Conclusion: The conformal whole breast radiotherapy enables optimisation of radiotherapy doses to target volume and organs at risk without affecting local control rates.

Database: EMBASE

31. Calculation of PTV margins for whole breast dibh radiotherapy using real-time surface imaging data

Author(s): Crosby J.; Malin M.; Hasan Y.; Chmura S.; Al-Hallaq H.; Kang H.

Source: Medical Physics; Jun 2017; vol. 44 (no. 6); p. 3006

Publication Date: Jun 2017

Publication Type(s): Conference Abstract

Abstract: Purpose: PTV margins for whole-breast radiotherapy treatments delivered during voluntary deep inspiration breath-hold (vDIBH) were calculated using real-time surface imaging (SI) data. Methods: Patients (n = 33) treated with mono-isocentric technique to the left (n = 16) and right (n = 17) breast and regional nodes via field-in-field tangents and supraclavicular fields were included. Treatment beams were gated using AlignRT by registering the whole breast region-of-interest to the surface generated from the simulation CT scan. AlignRT recorded real-time displacements every 0.3s in each dimension and the beam-on-state. Using an in-house MATLAB script, the means and standard deviations of the displacements during vDIBH for each treatment fraction were used to calculate PTV margins per the Van Herk equation. The intra-DIBH stability and the intra-fraction reproducibility were estimated as the 5th-to-95th percentile range of the corresponding data points in each breath-hold and fraction, respectively. Results: A total of 4022 breath-holds were detected over 740 fractions in which a median dose of 200cGy was delivered. Each patient was monitored for an average of 5.72+/-2.46 minutes/fraction. Calculated PTV margins were 5.5mm (VRT), 5.20mm (LNG), and 7.05mm (LAT). The intra-DIBH stability and the intrafraction reproducibility were estimated to be 0.92 mm and 1.96 mm, on average, respectively. The isotropic PTV margin calculated using SI data was smaller than others' x-ray imaging based calculations (6.2mm versus 9.3- 10.9mm) despite similar database sizes. When compared to breast surface displacement using spirometry-based positioning, the intra-DIBH variability and intra-fraction reproducibility of SI agreed to within 0.82mm and 0.32mm, respectively. Conclusion: While the intra-DIBH variability and

intra-fraction reproducibility are similar to those obtained with spirometrybased positioning, the overall breast surface reproducibility is superior to xray- based positioning as evidenced by smaller PTV margins calculated using SI. Although a PTV margin of 6mm is required, patients can reproduce their breath-hold position to within 2mm on any given treatment day.

Database: EMBASE

32. Individualized Selection of Beam Angles and Treatment Isocenter in Tangential Breast Intensity Modulated Radiation Therapy

Author(s): Penninkhof J.; Spadola S.; Breedveld S.; Baaijens M.; Heijmen B.; Lanconelli N.

Source: International Journal of Radiation Oncology Biology Physics; Jun 2017; vol. 98 (no. 2); p. 447-453

Publication Date: Jun 2017

Publication Type(s): Article

PubMedID: 28463164

Available at International journal of radiation oncology, biology, physics - from ScienceDirect

Abstract: Purpose and Objective Propose a novel method for individualized selection of beam angles and treatment isocenter in tangential breast intensity modulated radiation therapy (IMRT). Methods and Materials For each patient, beam and isocenter selection starts with the fully automatic generation of a large database of IMRT plans (up to 847 in this study); each of these plans belongs to a unique combination of isocenter position, lateral beam angle, and medial beam angle. The imposed hard planning constraint on patient maximum dose may result in plans with unacceptable target dose delivery. Such plans are excluded from further analyses. Owing to differences in beam setup, database plans differ in mean doses to organs at risk (OARs). These mean doses are used to construct 2-dimensional graphs, showing relationships between: (1) contralateral breast dose and ipsilateral lung dose; and (2) contralateral breast dose and heart dose (analyzed only for left-sided). The graphs can be used for selection of the isocenter and beam angles with the optimal, patient-specific tradeoffs between the mean OAR doses. For 30 previously treated patients (15 left-sided and 15 right-sided tumors), graphs were generated considering only the clinically applied isocenter with 121 tangential beam angle pairs. For 20 of the 30 patients, 6 alternative isocenters were also investigated. Results Computation time for automatic generation of 121 IMRT plans took on average 30 minutes. The generated graphs demonstrated large variations in tradeoffs between conflicting OAR objectives, depending on beam angles and patient anatomy. For patients with isocenter optimization, 847 IMRT plans were considered. Adding isocenter position optimization next to beam angle optimization had a small impact on the final plan quality. Conclusion A method is proposed for individualized selection of beam angles in tangential breast IMRT. This may be especially important for patients with cardiac risk factors or an enhanced risk for the development of contralateral breast cancer.

Database: EMBASE

33. Three dimensional conformal radiotherapy for synchronous bilateral breast irradiation using a mono iso-center technique

Author(s): Mani K.R.; Basu S.; Bhuiyan M.A.; Ahmed S.; Sumon M.A.; Haque K.A.; Sengupta A.K.; Un Nabi M.R.; Maria Das K.J.

Source: Polish Journal of Medical Physics and Engineering; Jun 2017; vol. 23 (no. 2); p. 15-19

Publication Date: Jun 2017

Publication Type(s): Article

Available at Polish Journal of Medical Physics and Engineering - from ProQuest (Hospital Premium Collection) - NHS Version

Available at Polish Journal of Medical Physics and Engineering - from International DOI Foundation

Abstract: Objective: The purpose of this study is to demonstrate the synchronous bilateral breast irradiation radiotherapy technique using a single isocenter. Materials and Methods: Six patients of synchronous bilateral breast were treated with single isocenter technique from February 2011 to June 2016. All the patients underwent a CT-simulation using appropriate positioning device. Target volumes and critical structures like heart, lung, esophagus, thyroid, etc., were delineated slice by slice in the CT data. An isocenter was placed above the sternum on the skin and both medial tangential and lateral tangential of the breast/chest wall were created using asymmetrical jaws to avoid the beam divergence through the lung and heart. The field weighting were adjusted manually to obtain a homogenous dose distribution. The planning objectives were to deliver uniform doses around the target and keep the doses to the organ at risk within the permissible limit. The beam energy of 6 MV or combination of 6 MV and 15 MV photons were used in the tangential fields according to the tangential separation. Boluses were used for all the mastectomy patients to increase the doses on the chest wall. In addition to that enhanced dynamic wedge and field in field technique were also used to obtain a homogenous distribution around the target volume and reduce the hot spots. The isocenter was just kept on the skin, such that the beam junctions will be overlapped only on the air just above the sternum. Acute toxicity during the treatment and late toxicity were recorded during the patient's follow-up. Results: During the radiotherapy treatment follow-up there were no acute skin reactions in the field junctions, but one patient had grade 1 esophagitis and two patients had grade 2 skin reactions in the chest wall. With a median follow-up of 38.5 months (range: 8 - 49 months), no patients had a local recurrence, but one patients with triple negative disease had a distant metastases in brain and died after 28 months. Conclusions: We were able to successfully treat the synchronous bilateral breast using single isocenter radiotherapy while keeping the lung and heart doses within the acceptable dose limits. During the treatment follow-up there were no symptoms of acute skin reactions in the field junction.

Database: EMBASE

34. Targeted dose enhancement in radiotherapy for breast cancer using gold nanoparticles, part 2: A treatment planning study.

Author(s): Strigari, Lidia; Ferrero, Veronica; Visonà, Giovanni; Dalmasso, Federico; Gobbato, Andrea; Cerello, Piergiorgio; Visentin, Sonja; Attili, Andrea

Source: Medical physics; May 2017; vol. 44 (no. 5); p. 1993-2001

Publication Date: May 2017

Publication Type(s): Journal Article

PubMedID: 28236658

Available at Medical Physics - from EBSCO (MEDLINE Complete)

Abstract:PURPOSEIn recent years, there has been growing interest in the use of gold nanoparticles (GNPs) combined with radiotherapy to improve tumor control. However, the complex interplay between GNP uptake and dose distribution in realistic clinical treatment are still somewhat unknown.METHODSThe effects of different concentrations of 2 nm diameter GNP, ranging from 0 to 5×105 nanoparticles per tumoral cell, were theoretically investigated. A parametrization of the GNP distribution outside the target was carried out using a Gaussian standard deviation σ, from a zero

value, relative to a selective concentration of GNPs inside the tumor volume alone, to 50mm, when GNPs are spatially distributed also in the healthy tissues surrounding the tumor. Treatment simulations of five patients with breast cancer were performed with 6 and 15 MV photons assuming a partial breast irradiation. A closed analytical reformulation of the Local Effect Model coupled with the estimation of local dose deposited around a GNP was validated using an in vitro study for MDA-MB-231 tumoral cells. The expected treatment outcome was quantified in terms of tumor control probability (TCP) and normal tissue complication probability (NTCP) as a function of the spatially varying gold uptake.RESULTSBreast cancer treatment planning simulations show improved treatment outcomes when GNPs are selectively concentrated in the tumor volume (i.e., $\sigma = 0$ mm). In particular, the TCP increases up to 18% for 5×105 nanoparticles per cell in the tumor region depending on the treatment schedules, whereas an improvement of the therapeutic index is observed only for concentrations of about 105 GNPs per tumoral cell and limited spatial distribution in the normal tissue.CONCLUSIONSThe model provides a useful framework to estimate the nanoparticle-driven radiosensitivity in breast cancer treatment irradiation, accounting for the complex interplay between dose and GNP uptake distributions.

Database: Medline

35. Quality assessment of delineation and dose planning of early breast cancer patients included in the randomized Skagen Trial 1

Author(s): Francolini G.; Offersen B.V.; Thomsen M.S.; Yates E.S.; Kirkove C.; Jensen I.; Blix E.S.; Kamby C.; Nielsen M.H.; Krause M.; Berg M.; Mjaaland I.; Schreiber A.; Kasti U.-M.; Boye K.

Source: Radiotherapy and Oncology; May 2017; vol. 123 (no. 2); p. 282-287

Publication Date: May 2017

Publication Type(s): Article

PubMedID: 28351523

Abstract: Background and purpose To report on a Quality assessment (QA) of Skagen Trial 1, exploring hypofractionation for breast cancer patients with indication for regional nodal radiotherapy. Material and methods Deviations from protocol regarding target volume delineations and dose parameters (Dmin, Dmax, D98%, D95% and D2%) from randomly selected dose plans were assessed. Target volume delineation according to ESTRO guidelines was obtained through atlas based automated segmentation and centrally approved as gold standard (GS). Dice similarity scores (DSC) with original delineations were measured. Dose parameters measured in the two delineations were reported to assess their dosimetric outcome. Results Assessment included 88 plans from 12 centres in 4 countries. DSC showed high agreement in contouring, 99% and 96% of the patients had a complete delineation of target volumes and organs at risk. No deviations in the dosimetric outcome were found in 76% of the patients, 82% and 95% of the patients had successful coverage of breast/chestwall and CTVn_L2-4-interpectoral. Dosimetric outcomes of original delineation and GS were comparable. Conclusions QA showed high protocol compliance and adequate dose coverage in most patients. Inter-observer variability in contouring was low. Dose parameters were in harmony with protocol regardless original or GS segmentation.

Database: EMBASE

36. Best of both worlds: 3D-CRT-based VMAT for locoregional irradiation in breast cancer

Author(s): Van Kollenburg P.G.M.; Meijer H.J.M.; Kunze-Busch M.C.; Poortmans P.

Source: Radiotherapy and Oncology; May 2017; vol. 123

Publication Date: May 2017

Publication Type(s): Conference Abstract

Abstract: Purpose or Objective Purpose: Postoperative locoregional radiation therapy (RT) is increasingly applied in breast cancer patients as it has been demonstrated to decrease the risk of any recurrence and breast cancer mortality in patients with node-positive disease after mastectomy or breast conserving therapy. However RT has also been associated with side effects such as fibrosis, cardiac and pulmonary toxicity, impaired shoulder function and the induction of secondary malignancies. It is therefore essential to use treatment techniques that enable the delivery of conformal and homogeneous doses, adequately covering the target volumes and limiting the dose to the organs at risk. The technique should also be robust taking into account changes in the position and the shape of the target volumes during treatment. We hereby present the results of the technique as being used in our department. Material and Methods Materials/Methods: 10 breast cancer patients with and an indication for locoregional RT were selected for dosimetric comparison between 3D-CRT and VMAT. All patients underwent a CTscan with 3-mm slice thickness. Patients with left-sided breast cancer were scanned and treated with voluntary moderately deep inspiration breathhold. The treatment plans were created in the Pinnacle3 treatment planning system V.9.10 with the Auto-Planning module, using 6 and/or 10MV beams. For each patient a CTV was delineated based on the ESTRO guidelines. A margin of 7 mm was used to generate a PTV. The following organs at risk were contoured: thyroid gland, heart, lungs, esophagus and contralateral breast. Treatment Planning: Prescription dose was 42,56 Gy in 16 fractions of 2,66 Gy. The 3D-CRT technique consisted of tangential beams for the breast/thoracic wall, one anterior beam (15degree or 345degree) for the medial periclavicular region and an anterior (15degree or 345degree) and posterior (165degree or 195degree) beam for the lateral periclavicular and axillary regions (Fig. 1.). For the VMAT technique tangential arcs of 24 degrees were chosen as these provide the best sparing of lung and heart and further minimize the low dose delivery to the rest of the body (integral dose). We analyzed PTV coverage including the conformation number (CN) and dose to the OARs to compare the techniques. Results Results: Table 1 shows the results. Mean V95% for the PTV was 95,3% for 3D-CRT and 97,5% for VMAT. CN was higher for the VMAT technique, indicating that PTV-coverage has improved at the same time as limiting the volume receiving a lower dose. Coverage was especially better with VMAT for lymph node levels 3-4. This came at a cost of a slightly higher dose to the thyroid gland. Dose to the lungs as well as the heart were lower with VMAT. Conclusion Conclusion: We developed a VMAT-only planning method for locoregional breast irradiation, which is straightforward, robust, can be combined with respiratory control and creates very conformal and homogeneous treatment plans with improved PTV coverage and low doses to the organs at risk. (Table Presented).

Database: EMBASE

37. MR-Linac based single fraction ablative radiotherapy for early-stage breast cancer: A planning study

Author(s): Van 't Westeinde T.; Charaghvandi K.R.; Scholten V.; Van Asselen B.; Van Den Bongard H.J.G.D.; Horton J.K.; Yoo S.

Source: Radiotherapy and Oncology; May 2017; vol. 123

Publication Date: May 2017

Publication Type(s): Conference Abstract

Abstract: Purpose or Objective Our department is currently working on the implementation of an MRI-linear accelerator (MR-linac) for several tumor sites. Dose distribution in the presence of a magnetic field can be affected by the electron return effect (ERE), which can occur at tissue boundaries like skin and lung. Other MRL settings such as the fixed collimator and isocenter position

may also influence the RT plan. We investigated the dosimetric feasibility of single fraction ablative radiotherapy in the prone and supine position for early-stage breast cancer using an MR-Linac approach. Material and Methods Preoperative contrast-enhanced (CE) CT and MRI scans were used from 10 cT1-2N0(sn) breast cancer patients included in an ongoing clinical trial on preoperative ablative radiotherapy. The gross tumor volume (GTV) was delineated on matched CE MRI- & CT-scans in the supine position. The clinical target volume (CTV) was created by expanding the GTV with 2 cm, thereby excluding skin and chest wall. The planning target volumes PTVGTV and PTVCTV were created by expanding both GTV and CTV 3 mm, excluding the skin. Prescribed doses were 20 Gy for PTVGTV and 15 Gy for PTVCTV. Rationale for dose prescription and organs at risk (OAR) constraints for a single fraction ablative RT were previously defined (1). Adequate target coverage was defined as 99% of the PTV should receive >=95% of the prescribed dose. Intensity modulated radiation therapy (IMRT) plans were made in the presence of a 1.5T magnetic field, using Monaco Research version 5.19.01 planning system. 7 beams with individually chosen beam angles were used for each plan. Dosimetry was evaluated in all simulated plans. Results For supine positioning the median volume that received at least 95% of the prescribed dose was >=99% for PTVGTV and PTVCTV. The median GTV volume was 1.1 cc, the median CTV volume 72.9 cc, the median PTVGTV volume 5.3 cc and the median PTVCTV volume was 104.9 cc. The median ratio PTVCTV to ipsilateral breast was 11.6%. The predefined OAR constraints were achieved in all plans (table 1). Conclusion Single fraction ablative radiotherapy in supine position on the MR-Linac is dosimetrically feasible. The feasibility of prone MR-linac treatment will be available at the 36th ESTRO conference. (Figure Presented).

Database: EMBASE

38. Iterative dataset optimization in automated planning: Implementation for breast radiotherapy

Author(s): Fan J.; Wang J.; Zhang Z.; Hu W.

Source: Radiotherapy and Oncology; May 2017; vol. 123

Publication Date: May 2017

Publication Type(s): Conference Abstract

Abstract: Purpose or Objective To develop a novel automated treatment planning solution for the breast radiotherapy. Material and Methods An automated treatment planning solution developed in this study includes selection of the optimal training dataset, dose volume histogram (DVH) prediction for the organs at risk (OARs) and automatically generation of the clinically acceptable treatment plans. The optimal training dataset was selected by using an iterative optimization strategy from 40 treatment plans for breast cancer patients who received radiation therapy. Firstly, the 2D KDE algorithm was applied to predict OAR DVH curves, including the heart and left lung, for patients in group A by considering the other group B as the training dataset. New plans in group A were automatically generated using the Pinnacle3 Auto-Planning (AP) module (version 9.10, Philips Medical Systems) based on the dose constrains derived from the predicted DVHs. Next the point-wise comparison, taking V5, V20 and mean value as the criteria, between the automatic plans and original clinical plans was performed both objectively and subjectively. Finally the preferred plans in group A got updated after the comparison and were used for the next iteration by considering itself as the training dataset instead. Above steps repeated until search and update for new preferred plans was exhausted. After selecting the optimal training dataset, additional 10 new breast treatment plans were re-planned using the AP module with the objective functions derived from the predicted DVH curves. These automatically generated re-optimized treatment plans were compared with the original manually optimized plans. Results The proposed new iterative optimization strategy, shown in Fig. 1, could effectively select the optimal training dataset and improve the

accuracy of the DVH prediction. The average of mean dose of the OARs in the iterative process for each group, group A and group B are illustrated in Fig. 2. The dose differences, between the real and prediction, decreased with iterations which indicated the convergence of our proposed technique. As can be seen from Tab. 1, the automatically AP generated treatment plans using the dose constrains derived from the predicted DVHs could achieve better dose sparing for some OARs with the other comparable plan qualities. Conclusion The proposed novel automated treatment planning solution can be used to efficiently evaluate and improve the quality and consistency of the treatment plans for modulated breast radiation therapy.

Database: EMBASE

39. Automated treatment planning for breast and locoregional lymph nodes using Hybrid RapidArc

Author(s): Van Duren-Koopman M.J.; Tol J.P.; Dahele M.; Meijnen P.; Florijn R.; Slotman B.J.; Verbakel W.F.A.R.

Source: Radiotherapy and Oncology; May 2017; vol. 123

Publication Date: May 2017

Publication Type(s): Conference Abstract

Abstract: Purpose or Objective Breast cancer accounts for a substantial proportion of the workload in many radiotherapy departments. Treatment planning, especially for breast and locoregional lymph nodes (LLNs) can be complex and time-consuming. Automated planning techniques can improve planning efficiency and consistency. Automated planning of tangential field breast-only irradiations has been previously described. We developed a script using the Eclipse API to automatically plan a more complex hybrid RapidArc (hRA) technique for breast plus LLNs that includes the integration of RapidPlan (RP) into the workflow. Material and Methods The script uses the clinician delineated breast planning target volume (PTVb) and LLN PTV (PTVLLN) as input to automate field setup (Figure). The hRA technique consists of two combined plans: 1. Two tangential fields (TFs) with a 2cm cranial slip-zone that deliver 85% of the prescribed dose (PD) to 95% of PTVb. Optimal gantry angles and field settings of the TFs are automatically determined by minimizing the organ-at-risk (OAR) surfaces in the beam's eye view. Optimal beam energy is based on PTV dose homogeneity, and field weightings are based on symmetry of dose distribution. 2. Three 80degree RA arcs deliver the remaining dose to the PTVb and slip-zone, and the full PD to the PTVLLN, while sparing tissue outside the PTV. RA fields are positioned automatically using standard gantry angles. Optimization objectives for the relevant OARs (ipsilateral (IL) and contralateral (CL) lung, heart, CL breast, esophagus, thyroid, spinal canal) are automatically placed using dose predictions generated by RP. RA optimization is currently started manually as the scripting API does not yet allow for the inclusion of a previously calculated dose, but interaction during optimization is not required. Results Treatment plans were generated by the script in ~40 minutes (of which 2 minutes were user interaction), while the estimated corresponding manual time was 100- 200 minutes. The automated workflow was capable of generating a plan for all patients. However, a number of improvements to the scripting environment have been suggested to the vendor. The dosimetric data was averaged over all 5 patients and was generally comparable between the automated and manual plans (Table), although for individual patients it was evident that the RP model requires further refinements to reduce some OAR doses. Conclusion Plan generation for breast with locoregional nodes was successfully automated using the Eclipse scripting API to create a workflow that integrates the RP knowledge-based planning system, and a combination of different techniques: open fields, slip zone, RA. Automated generation of treatment plans is anticipated to lead to more consistent and efficient planning. It may also facilitate the transfer of complex treatment planning techniques between centers. (Figure Presented).

Database: EMBASE

40. Automatic treatment planning of FFF VMAT for breast cancer: Fast planning and fast treatment

Author(s): Lorenzen E.L.; Gottlieb K.L.; Hansen C.R.; Jensen H.R.; Jensen J.D.; Nielsen M.H.; Ewertz M.

Source: Radiotherapy and Oncology; May 2017; vol. 123

Publication Date: May 2017

Publication Type(s): Conference Abstract

Abstract: Purpose or Objective Forward planned tangential radiotherapy with wedges or few segments is the standard technique in many centres for radiotherapy after breast conserving surgery. Helical techniques such as Thomotherapy and VMAT can be used to increase conformity but may increase the volume receiving low doses and the treatment planning can be time-consuming. In the present study we evaluate FFF VMAT using automated planning by comparison with manually planned tangential radiotherapy on its plan quality as well as its efficiency in both treatment planning and delivery. Material and Methods Twenty patients, ten right-sided and ten left-sided, were selected by including all patients receiving partial breast radiotherapy between the 1/6-2016 and the 19/9-2016 at our institution. All patients were treated with forward planned tangential step-and-shoot 6MV fields and with 18MV fields used partly for larger breasts. The ten leftsided patients were treated in breath hold using ABC from Elekta. For each patient an additional plan was generated, using two small (30-40 degrees) 6 MV FFF VMAT fields with tangential like beam angels. Dose planning was done in Pinnacle 9.10 and the Auto-Planning module was used for generation of the VMAT plans. Mean doses to target regions and organs and risk were compared using paired ttests. Results VMAT plans were generated fast with a median time for complete plan generation by Auto-Plan of 10,5 min (range: 9 min - 12 min) with further adjustments needed for 7/20 patients (5 min -15 min additional time). Mean doses to target regions and organs at risk are shown in the table. The doses were similar from both plans except for the dose to the ipsilateral lung being statistically significant lower from the VMAT plans. Dose volume histograms for the ipsilateral lung and the PTV are shown in figure a) and b) respectively. As shown, the dose to ipsilateral lung was lower for all dose levels in the VMAT plans even though the coverage of the PTV was better. The measured delivery time of all VMAT fields were 14,5 s (range: 10 s - 22 s). As a result all VMAT plans could potentially be delivered within two breath holds (our threshold for maximum breath hold duration is 25 s). In comparison the median number of breath holds required for the ten leftsided patients treated in breath hold in the forward planned treatment was 4 (range: 2 - 7). (Table presented) Conclusion Auto-Plan in Pinnacle allowed fast planning of FFF VMAT plans for partial breast cancer radiotherapy. Compared to forward planned tangential radiotherapy the WMAT plans were better at both sparring of the ipsilateral lung and in covering the PTV. The VMAT plans could be delivered quickly, and as a result patients treated in breath hold could be treated with half the number of breath holds.

Database: EMBASE

41. Intra-fractional isocenter position analysis and dose evaluation of DIBH using surface guided RT

Author(s): Berg L.; Kugele M.; Alkner S.; Andersson-Ljus C.; Ceberg S.; Edvardsson A.

Source: Radiotherapy and Oncology; May 2017; vol. 123

Publication Date: May 2017

Publication Type(s): Conference Abstract

Abstract: Purpose or Objective The use of surface-guided radiotherapy (SGRT) for deep inspiration breath hold (DIBH) was investigated. Cardiac and pulmonary dose-volume indices were compared during free breathing (FB) and DIBH for left-sided breast cancer patients. In this study, we calculated intra-fractional isocenter shifts based on surface scanning for the first time to investigate potential breathing variations during beam delivery for the individual patient. Material and Methods Twenty patients treated with tangential technique, SGRT and DIBH were included. They underwent two computed tomography (CT) scans; one during FB and one during DIBH, which enabled a dose planning study evaluating possible dose sparing with SGRT and DIBH. Target volumes and risk organs were contoured by the same physician in both scans. Individual treatment plans were created and dose-volume indices for the heart, the left anterior descending artery (LAD) and the ipsilateral lung were evaluated. The optical scanning (OS) systems Sentinel and Catalyst HD (C-RAD positioning AB, Sweden) were used at CT and treatment, respectively. At CT the breathing motion was monitored using an optical tracking point on the skin above the xiphoid process. The size of the gating window was 3 mm and the amplitude of the breath hold was individual for each patient. At treatment the OS system was used for both patient positioning and DIBH delivery. The irradiation was controlled using the tracking point and with the same amplitude and gating window determined during the CT session. Retrospectively, the coordinates of the calculated isocenter according to the OS system during beam-on was used to investigate intra-fractional motion in between the two separate DIBHs during beam delivery of the two tangential fields. The difference in isocenter position was evaluated for 190 DIBHs from randomly selected treatment fractions. Results The mean DIBH amplitude was 10.5+/-2.8 (1 SD) mm. The mean dose for the heart was reduced from 1.5+/-0.8 Gy for FB to 0.8+/-0.3 Gy for DIBH, and for the lung from 5.9+/-1.4 Gy for FB to 5.5+/-1.5 Gy for DIBH. Dose sparing was also seen for LAD where the mean dose was 9.6+/-7.0 Gy for FB and 3.8+/-2.9 Gy for DIBH. The maximum doses, represented as D2%, were reduced from 14.4+/-15.2 Gy for FB to 3.6+/-2.7 Gy for DIBH and from 29.0+/-18.9 Gy for FB to 10.8+/-12.3 Gy for DIBH for the heart and LAD, respectively. The intrafractional motion of the isocenter between two DIBHs was small and the median values were 1.3 mm, 1.2 mm and 0.9 mm in the lateral, longitudinal and vertical directions, respectively (Figure 1). Conclusion For the first time, optical surface scanning was used to evaluate isocenter motion during irradiation. The median intra-fraction motion of the isocenter in the breast during beam-on was less than 1.3 mm in all directions, using a tracking point above xiphoid process and a 3 mm gating window. It was shown, within this study, that the use of SGRT during DIBH for left-sided breast cancer patients results in decreased doses to organs at risk (Figure Presented).

Database: EMBASE

42. Dosimetric feasibility of an "off-breast isocenter" technique for whole-breast cancer radiotherapy

Author(s): Casals Farran J.; Calvo-Ortega J.F.; Moragues S.; Pozo-Masso M.

Source: Radiotherapy and Oncology; May 2017; vol. 123

Publication Date: May 2017

Publication Type(s): Conference Abstract

Abstract: Purpose or Objective The use of kilovoltage orthogonal setup images has spread in last years in breast radiotherapy. There is a potential risk of collision imaging system-patient when the isocenter is laterally placed. The aim of this study is to investigate the viability of placing the treatment isocenter at the patient midline for breast cancer radiotherapy, in order to avoid the risk of collisions during image-guided setup and treatment delivery. Material and Methods Twenty IMRT plans designed by placing the isocenter within the breast volume ("plan-ref"), were retrospectively replanned by shifting the isocenter at the patient's midline ("planvoff-breast"). An integrated

simultaneous boost (SIB) technique was used. Multiple metrics for the planning target volumes (PTVs) and organs at risk (OARs) were compared for both approaches using a paired t test. Results Comparing planvref vs. plan-off-breast, no significant differences in PTV coverage (V95%) were found (96.5% vs. 96.2%; p= 0.361 to PTVbreast; 97.0% vs. 97.0%; p= 0.977 to PTVtumor-bed). With regard to OARs, no substantial differences were observed in any analyzed metric: V5Gy (30.3% vs. 31.4%; p= 0.486), V20Gy (10.3% vs. 10.3%; p= 0.903) and mean dose (7.1 Gy vs. 7.1 Gy; p= 0.924) to the ipsilateral lung; V5Gy (11.2% vs. 10.0%; p= 0.459), V30Gy (0.7% vs. 0.6%; p= 0.251) and mean dose (2.3 Gy vs. 2.2 Gy; p= 0.400) to the heart; and average dose to the contralateral breast (0.4 Gy vs. 0.5 Gy; p= 0.107). Conclusion The off-breast isocenter solution resulted in dosimetrically comparable plans as the reference technique, avoiding the collision risk during the treatment session.

Database: EMBASE

43. Analysis of flattened and flattening filter free breast planning techniques with deep inspiration breath hold

Author(s): Dean J.; Phan J.; Last A.; Chandroth M.; Hoffmann M.; Hansen C.; Shakespeare T.; Aherne N.

Source: Journal of Medical Radiation Sciences; Mar 2017; vol. 64 ; p. 66

Publication Date: Mar 2017

Publication Type(s): Conference Abstract

Available at Journal of Medical Radiation Sciences - from Wiley Online Library Free Content - NHS

Available at Journal of Medical Radiation Sciences - from Europe PubMed Central - Open Access

Available at Journal of Medical Radiation Sciences - from PubMed Central

Abstract: Objectives: Deep inspiration breath hold (DIBH) has been shown to decrease doses to the heart and lungs for patients having left breast radiotherapy. The technique requires the patient to hold their breath during imaging and beam-on time. Flattening filter free (FFF) beams deliver monitor units more rapidly than multiple flattened beams and would be expected to reduce treatment, and therefore, breath hold time. The aim of this study is to compare the dosimetry and treatment times for standard multiple flattened beam plans with those generated for the FFF beam. Methods: DIBH scans from left breast patients were parallelplanned using multiple-flattened and FFF planning techniques. These included; tangential intensity modulated radiation therapy (IMRT), partial volumetric modulated arc therapy (VMAT) and full VMAT for each patient. Plans were normalised to cover the PTVeval with 95% of TD to allow for an accurate comparison between the plans and of doses to organs at risk. The quality assurance (QA) plans were then timed during delivery to ascertain the respective treatment delivery times. Results: Data collection is ongoing and results will be discussed in the presentation. Conclusion: Conclusions will be drawn once data collection and analysis has been completed. It is expected that the dosimetry for the techniques will be comparable, but that the FFF plans will be delivered over a shorter period of time than the flattened plans.

Database: EMBASE

44. Improving the efficiency of breast radiotherapy treatment planning using a semi-automated approach.

Author(s): Mitchell, Robert A; Wai, Philip; Colgan, Ruth; Kirby, Anna M; Donovan, Ellen M

Source: Journal of applied clinical medical physics; Jan 2017; vol. 18 (no. 1); p. 18-24

Publication Date: Jan 2017

Publication Type(s): Journal Article

PubMedID: 28291912

Abstract:OBJECTIVESTo reduce treatment planning times while maintaining plan quality through the introduction of semi-automated planning techniques for breast radiotherapy.METHODSAutomatic critical structure delineation was examined using the Smart Probabilistic Image Contouring Engine (SPICE) commercial autosegmentation software (Philips Radiation Oncology Systems, Fitchburg, WI) for a cohort of ten patients. Semiautomated planning was investigated by employing scripting in the treatment planning system to automate segment creation for breast step-and-shoot planning and create objectives for segment weight optimization; considerations were made for three different multileaf collimator (MLC) configurations. Forty patients were retrospectively planned using the script and a planning time comparison performed.RESULTSThe SPICE heart and lung outlines agreed closely with clinician-defined outlines (median Dice Similarity Coefficient > 0.9); median difference in mean heart dose was 0.0 cGy (range -10.8 to 5.4 cGy). Scripted treatment plans demonstrated equivalence with their clinical counterparts. No statistically significant differences were found for target parameters. Minimal ipsilateral lung dose increases were also observed. Statistically significant ($P < 0.01$) time reductions were achievable for MLCi and Agility MLC (Elekta Ltd, Crawley, UK) plans (median 4.9 and 5.9 min, respectively).CONCLUSIONSThe use of commercial autosegmentation software enables breast plan adjustment based on doses to organs at risk. Semi-automated techniques for breast radiotherapy planning offer modest reductions in planning times. However, in the context of a typical department's breast radiotherapy workload, minor savings per plan translate into greater efficiencies overall.

Database: Medline

45. Elective breast radiotherapy including level I and II lymph nodes: A planning study with the humeral head as planning risk volume.

Author(s): Surmann, Kathrin; van der Leer, Jorien; Branje, Tammy; van der Sangen, Maurice; van Lieshout, Maarten; Hurkmans, Coen W

Source: Radiation oncology (London, England); Jan 2017; vol. 12 (no. 1); p. 22

Publication Date: Jan 2017

Publication Type(s): Journal Article

PubMedID: 28100239

Available at Radiation Oncology - from BioMed Central

Available at Radiation Oncology - from Europe PubMed Central - Open Access

Available at Radiation Oncology - from EBSCO (MEDLINE Complete)

Available at Radiation Oncology - from PubMed Central

Abstract:BACKGROUNDThe aim of this study was to assess the dose to the humeral head planning risk volume with the currently used high tangential fields (HTF) and compare different planning techniques for breast radiotherapy including axillary level I and II lymph nodes (PTVn) while sparing the humeral head.METHODSTen patients with left-sided breast cancer were enrolled in a planning study with 16 fractions of 2.66 Gy. Four planning techniques were compared: HTF, HTF with sparing of the humeral head, 6-field IMRT with sparing of the humeral head and VMAT with sparing of the humeral head. The humeral head + 10 mm was spared by restricting V40Gy < 1 cc.RESULTSThe dose to the humeral head was too high with HTF (V40Gy on average 20.7 cc). When sparing the humeral

head in HTF, PTVn V90% decreased significantly from 97.9% to 89.4%. 6-field IMRT and VMAT had a PTVn V90% of 98.2% and 99.5% respectively. However, dose to the lungs, heart and especially the contralateral breast increased with VMAT.CONCLUSIONSThe humeral head is rarely spared when using HTF. When sparing the humeral head, the 6-field IMRT technique leads to adequate PTV coverage while not increasing the dose to the OARs.

Database: Medline

46. Is the Deep Inspiration Breath-Hold Technique Superior to the Free Breathing Technique in Cardiac and Lung Sparing while Treating both Left-Sided Post-Mastectomy Chest Wall and Supraclavicular Regions

Author(s): Darapu A.; Balakrishnan R.; Sebastian P.; John S.; Kather Hussain M.R.; Ravindran P.

Source: Case Reports in Oncology; Jan 2017; vol. 10 (no. 1); p. 37-51

Publication Date: Jan 2017

Publication Type(s): Article

Available at Case Reports in Oncology - from Europe PubMed Central - Open Access

Available at Case Reports in Oncology - from PubMed Central

Abstract: Aims: To evaluate the efficacy of the deep inspirational breath-hold (DIBH) technique and its dosimetric advantages over the free breathing (FB) technique in cardiac (heart and left anterior descending artery [LAD]) and ipsilateral lung sparing in left-sided post-mastectomy field-in-field conformal radiotherapy. DIBH is highly reproducible, and this study aims to find out its dosimetric benefits over FB. Materials and Methods: Nineteen left-sided mastectomy patients were immobilized using breast boards with both arms positioned above the head. All patients had 2 sets of planning CT images (one in FB and another in DIBH) with a Biograph TruePoint HD CT scanner in the same setup. DIBH was performed by tracking the respiratory cycles using a Varian Real-Time Position Management system. The target (chest wall and supraclavicular region), organs at risk (OARs; ipsilateral lung, contralateral lung, heart, LAD, and contralateral breast), and other organs of interests were delineated as per the RTOG (Radiation Therapy Oncology Group) contouring guidelines. The single-isocenter conformal fields in the field treatment plans were generated with the Eclipse Treatment Planning System (Varian Medical Systems) for both FB and DIBH images, and the doses to the target and OARs were compared. The standard fractionation regimen of 50 Gy in 25 fractions over a period of 5 weeks was used for all patients in this study. Results and Discussion: The target coverage parameters (V95, V105, V107, and D_{mean}) were found to be 97.8 +/- 0.9, 6.1 +/- 3.4, 0.2 +/- 0.3, and 101.9 +/- 0.5% in the FB plans and 98.1 +/- 0.8, 6.1 +/- 3.2, 0.2 +/- 0.3, and 101.9 +/- 0.4% in the DIBH plans, respectively. The plan quality indices (conformity index and homogeneity index) also showed 1.3 +/- 0.2 and 0.1 for the FB plans and 1.2 +/- 0.3 and 0.1 for the DIBH plans, respectively. There was a significant reduction in dose to the heart in the DIBH plans compared to the FB plans, with p values of nearly 0 for the V5, V10, V25, V30, and D_{mean} dosimetric parameters. The difference in ipsilateral lung doses between FB and DIBH showed statistically significant p values, and the differences in mean doses were found to be 7, 15.7, 11.8, and 10.7% for V5, V20, V30, and D_{mean}, respectively. There was a significant reduction in dose to the LAD in the DIBH compared to the FB plans. Conclusions: DIBH resulted in significant reductions in doses to the heart, LAD, and lungs, since with this technique there was an increase in the distance between the target and the OARs. With appropriate patient selection and adequate training, the DIBH technique is acceptable and achievable for radiotherapy to the chest, and therefore should be considered for all suitable patients, as this could result in fewer radiotherapy-related complications. However, this technique is time-consuming, since the

setup is complex, results in an increased time for treatment delivery, and needs patient cooperation and technical expertise.

Database: EMBASE

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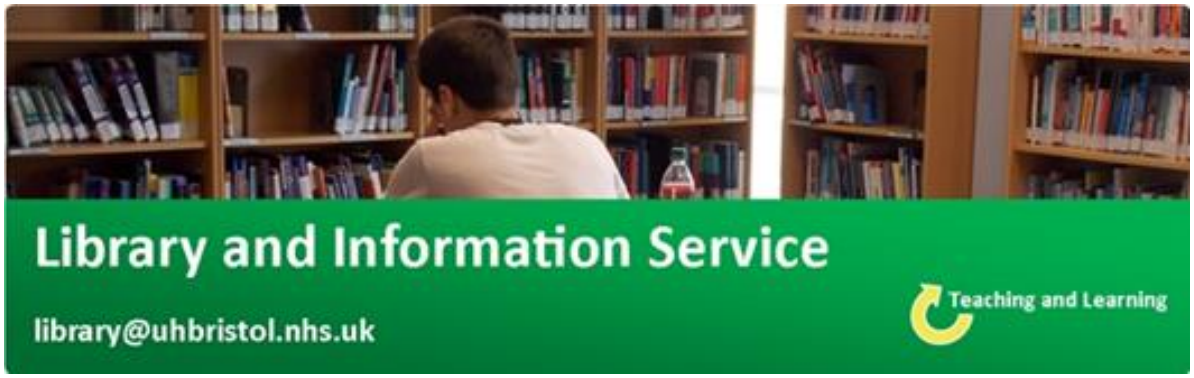

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