Technical Innovations & Patient Support in Radiation Oncology 20 (2021) 64–65

Contents lists available at ScienceDirect

Technical Innovations & Patient Support in Radiation Oncology

journal homepage: www.sciencedirect.com/journal/technical-innovations-and-patient-support-in-radiation-oncology

Correspondence

Hypothesis of a decision-making algorithm for adjuvant radiotherapy in left-sided breast cancer patients

ARTICLE INFO

Keywords
3D conformal radiotherapy
adjuvant radiotherapy for left breast cancer
Deep Inspiration Breath Hold radiotherapy
Treatment-related risks
Heart injuries
Heart risk & prevention

To the Editor,

In a recent issue of this journal Ferdinand et al. reported interesting data about deep inspiratory breath-hold (DIBH) technique in the treatment of left breast cancer patients [1]. This paper has been published almost simultaneously to our work focused on the same issue [2]. Since cardiac structures are intended to be spared from undesirable radiation exposure in order to prevent heart injuries, in recent years various radiotherapy techniques and technical ploys were tested, likewise to what was done for other clinical scenarios [3,4], to averting such a concern in radiotherapy departments [5]. Among these solutions, radiation delivery with a respiratory gating system emerges as the most promising, although not the easiest to apply and the least cumbersome one from a treatment planning point of view [6]. Furthermore, this treatment option is not always feasible and equally advantageous for all patients, some of them requiring a long training or even the recourse to more compliant radiotherapy techniques (i.e. IMRT or VMAT in free-breathing), as those effectively used for other curative settings [7]. Hence, the need for in advance selection of eligible patients for DIBH technique is evident, also to streamline the workload of high capacity centers [8]. The attempt to identify some immediately recognizable anatomical predictors for such an aim was quite ineffectual [9]. This finding was likely due to a not adequately large sample size or to an inappropriate searching. The anatomical and dosimetric parameters to evaluate for assessing and preventing cardiac risk are those proposed by Register et al. [10]. Accordingly, Ferdinand et al. [1] found a significant correlation between reduction in heart volume in field (HVIF) and maximum heart depth (MHD) with reduction in mean heart dose. However, these parameters are not a priori foreseeable. Interestingly, none of the two Δ correlated with left anterior descending coronary artery (LAD) maximum dose, but only with its mean dose (exclusively ΔHVIF), thereby remarking the substantially borderline and high risk location of this serial organ at risk, hardly displaceable and extremely close to the edge of dangerous isodose lines in tangent fields pattern (i.e. V19Gy for hypofractionated schedule and V20Gy for normofractionated one). This condition questions the actual reliability of DIBH technique in preventing cardiac risk. To address this issue, an in vivo dosimetry or an indirect assessment of cardiac absorbed dose by means of specific tests, such as blood levels of myocardial enzymes (i.e. troponin isoforms), electrocardiogram, radionuclide cardiac imaging, are required: the latter approach is the only viable. Indeed, all DIBH reports are dosimetric and have never been clinically confirmed. So, we believe that DIBH technique advantage over other equally promising approaches (i.e. IMRT) is to be detected in specific clinical trials. While waiting for it, we feel confident enough to propose our findings, relative to breast size and chest wall separation (namely the tangent fields distance in our article), to better predict the main beneficiaries of DIBH technique, as we are aware of the lack of a standard therapeutic proposal and of the need for a personalized approach, as for other treatment body sites [11]. We recommend to pay particular attention when treating left breast, a site that, as well known, may keep trace of a previous radiation treatment [12]. Lastly, we propose the following algorithm to determine the better therapeutic choice for left-sided breast cancer patients (Fig. 1). We think it is important for the authors to comment on these issues and reply in the context of this journal.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DOIs of original article: https://doi.org/10.1016/j.tipsro.2021.06.002, https://doi.org/10.1016/j.tipsro.2021.02.006.

https://doi.org/10.1016/j.tipsro.2021.06.003
Received 4 June 2021; Accepted 23 June 2021
Available online 16 December 2021

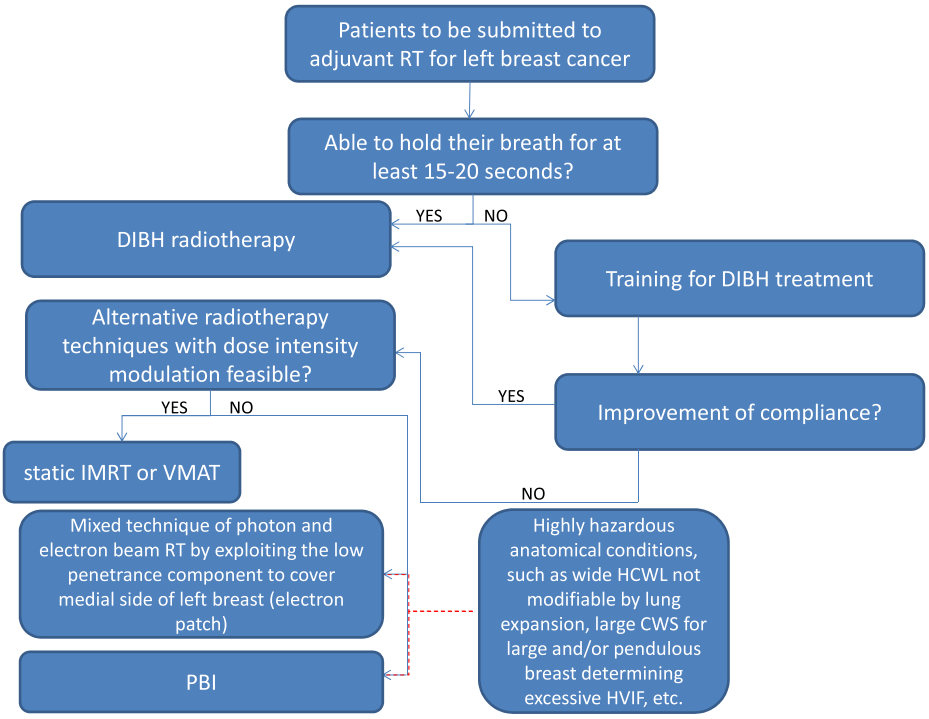

Fig. 1. Hypothesis of a decision-making algorithm for adjuvant radiotherapy in left-sided breast cancer patients. RT, radiotherapy, DIBH, deep inspiration breath hold, IMRT, intensity modulated radiation therapy, VMAT, volumetric modulated arc therapy, PBI, partial breast irradiation, HCWL, heart chest wall lenght, CWS, chest wall separation, HVIF, heart volume in field.

References

[1] Ferdinand S, Mondal M, Mallik S, Goswami J, Das S, Manir KS, et al. Dosimetric analysis of Deep Inspiratory Breath-hold technique (DIBH) in left-sided breast cancer radiotherapy and evaluation of pre-treatment predictors of cardiac doses for guiding patient selection for DIBH. Tech Innov Patient Support Radiat Oncol 2021; 1(17):25–31. https://doi.org/10.1016/j.tipsro.2021.02.006. PMID: 33681484; PMCID: PMC7930610.

[2] Ferini G, Molino L, Tripoli A, Valenti V, Illari SI, Marchese VA, et al. Anatomical predictors of dosimetric advantages for deep-inspiration-breath-hold 3D-conformal radiotherapy among women with left breast cancer. Anticancer Res 2021;41(3): 1529–38. https://doi.org/10.21873/anticanres.14912. PMID: 33788746.

[3] Ferini G, Pergolizzi S. A ten-year-long update on radiation proctitis among prostate cancer patients treated with curative external beam radiotherapy. In Vivo 2021;35 (3):1379–91. https://doi.org/10.21873/invivo.12390. Epub 2021 Apr 28. PMID: 33910815.

[4] Cacciola A, Parisi S, Tamburella C, Lillo S, Ferini G, Molino L, et al. Stereotactic body radiation therapy and radiofrequency ablation for the treatment of liver metastases: how and when? Rep Pract Oncol Radiother 2020;25(3):299–306. https://doi.org/10.1016/j.rpor.2020.02.010. PMID 32194349.

[5] Duma MN, Baumann R, Budach W, Dunst J, Feyer P, Fietkau R, et al. Heart-sparing radiotherapy techniques in breast cancer patients: a recommendation of the breast cancer expert panel of the German society of radiation oncology (DEGRO). Strahlenther Onkol 2019;195(10):861–71. https://doi.org/10.1007/s00066-019-01495-w. Epub 2019 Jul 18. PMID: 31321461.

[6] Desai N, Currey A, Kelly T, Bergom C. Nationwide trends in heart-sparing techniques utilized in radiation therapy for breast cancer. Adv Radiat Oncol 2019;4(2): 246–52. https://doi.org/10.1016/j.adro.2019.01.001. PMID: 31011669; PMCID: PMC6460327.

[7] Ferini G, Tripoli A, Molino L, Cacciola A, Lillo S, Parisi S, et al. How much daily image-guided volumetric modulated arc therapy is useful for proctitis prevention with respect to static intensity modulated radiotherapy supported by topical medications among localized prostate cancer patients? Anticancer Res 2021;41(4): 2101–10. https://doi.org/10.21873/anticanres.14981. PMID: 33813420.

[8] van der Laan HP, Hurkmans CW, Kuten A, Westenberg HA. EORTC-ROG Breast Working Party. Current technological clinical practice in breast radiotherapy; results of a survey in EORTC-Radiation Oncology Group affiliated institutions. Radiother Oncol 2010;94(3):280–5. https://doi.org/10.1016/j.radonc.2009.12.032. Epub 2010 Jan 28. PMID: 20116120.

[9] Johansen S, Vikström J, Hjelstuen MH, Mjaaland I, Dybvik KI, Olsen DR. Dose evaluation and risk estimation for secondary cancer in contralateral breast and a study of correlation between thorax shape and dose to organs at risk following tangentially breast irradiation during deep inspiration breath-hold and free breathing. Acta Oncol 2011;50(4):563–8. https://doi.org/10.3109/0284186X.2010.541933. Epub 2011 Mar 3 PMID: 21370938.

[10] Register S, Takita C, Reis I, Zhao W, Amestoy W, Wright J. Deep inspiration breath-hold technique for left-sided breast cancer: An analysis of predictors for organ-at-risk sparing. Med Dosim 2015;40(1):89–95. https://doi.org/10.1016/j.meddos.2014.10.005. Epub 2014 Dec 17. PMID: 25534166.

[11] Ferini G, Molino L, Bottalico L, De Lucia P, Garofalo F. A small case series about safety and effectiveness of a hypofractionated electron beam radiotherapy schedule in five fractions for facial non melanoma skin cancer among frail and elderly patients. Rep Pract Oncol Radiother 2021;26(1):66–72. https://doi.org/10.5603/RPOR.a2021.0013. PMID: 33948304; PMCID: PMC8086708.

[12] Sindoni A, Severo C, Vadala' RE, Ferini G, Mazzei MM, Vaccaro M, et al. Levetiracetam-induced radiation recall dermatitis in a patient undergoing stereotactic radiotherapy. J Dermatol 2016;43(12):1440–1. https://doi.org/10.1111/1346-8138.13427. Epub 2016 Apr 30 PMID: 27129895.

Gianluca Ferini*
REM Radioterapia srl, Viagrande I-95029, Catania, Italy

Laura Molino
Department of Biomedical and Dental Sciences, Morphological and Functional Images, University of Messina, Messina (ME) I-98100, Italy
E-mail address: molinolaura.ct@gmail.com.

* Corresponding author at: REM Radioterapia srl, Via Penninazzo 11, 95029, Viagrande (CT), Italy. Phone: +39 3311341117.
E-mail address: gianlucaferini@hotmail.it (G. Ferini).