Letter to the Editor concerning Bhandari *et al*. "Impact of repeat computerized tomography replans in the radiation therapy of head and neck cancers"

Sir,

Since only a few studies have been published on this topic, we have read with great interest the article of Bhandari and colleagues titled "Impact of repeat computerized tomography (CT) replans in the radiation therapy of head and neck cancers",[1] which highlights an important problem for radiation oncologists. In this paper, the authors investigated the importance of repeating CT scan and replanning during a course of head and neck intensity modulated radiation therapy (HN-IMRT), combined with concurrent chemotherapy (CC), in order to reduce the discrepancies between planned and delivered dose to planning target volume (PTV) and organs at risk (OARs) due to radiotherapy volume and anatomical changes.

As they explain in the introduction, using IMRT to treat HN cancer patients, it is extremely important to detect anatomical changes occurring during the treatment because, as dose gradients between the target volumes and OARs are very high, they can lead to inappropriate dose coverage of the volumes and/or OARs, resulting in a possible cause of marginal recurrence or toxicity.

In this study, the authors compared volumetric and dosimetric parameters of the two different IMRT plans in 15 selected advanced HN cancer patients: an "Actual Plan" (AP), which was generated on the second CT scan (performed after the third week of the treatment), and a "Hybrid Plan" (HP) obtained by applying the original plan to the second CT scan.

The findings on the analyzed data showed a reduction of mean dose (Dmean) and PTV coverage on HP, and a statistically significant increase in median dose (Dmean) of both parotid glands (PGs) and maximum dose (Dmax) for spinal cord and brainstem on HP compared to AP, confirming the dosimetric benefit of replanning.[1]

In our recently preliminary published data,[2] volumetric and positional changes of PTVs and OARs were analyzed in 10 HN cancer patients treated with IMRT ± CC, using consecutive off-board CT scans at 3, 5 and 7 weeks during treatment in a department of Radiation Oncology not equipped with in-room Image-Guided Radiation Therapy (IGRT).

Reference planning CT study and the newly acquired CT image sets were co-registered with mutual information modality. Automatic transfer of both target volumes and OARs from planning CT to each subsequent CT scans was then performed. Based on some literature data,[3] in our study, dosimetric aspects were not investigated and target volumes were not re-delineated upfront during IMRT even if a shrinkage of gross tumor volume (GTV) was achieved.

In our series, apart from two patients in whom replanning was needed due to body weight loss > 5%, the results evidenced only a decrease of PG volume with a trend in volume reduction for ipsilateral irradiated PG. No significant shifts of PTVs (mean relative shift < 0.1 cm) and PGs, or spinal cord at C1 and C6 level was detected, and the collected data demonstrated a trend in external skin contours volume loss, with a mean reduction less than 5% for all patients. Similar considerations are confirmed by other authors' previous results.[4,5]

Literature data demonstrated that significant weight loss is often correlated with positional shift of target volume and it is extremely important to detect it before volume changes can affect dose distribution to PTV or OARs.[5] However, comparing with our results, Bhandari *et al*. recorded a high incidence of weight loss, with 40% of patients requiring feeding tube and a new immobilization device, while in our series only 2 patients (20%) had a significant weight loss (> 5%) leading to replacement of thermoplastic mask and mandatory replanning.

It may be argued that in our analysis dosimetric parameters were not investigated on repeat CT scans: in our preliminary results, we recorded a PTV mean shift < 0.1 cm; therefore, taking into account the safety margin of PTVs, no significant dosimetric differences were expected in relation to that shift. Wu *et al*. conducted a study on 11 HN cancer patients to evaluate the difference between the planned and the delivered dose distribution in order to investigate planning margin and to define optimal planning strategies. The authors concluded that replanning was not necessary for adapting tumors to volumetric changes because no significant dosimetric modifications of the target volume were observed.[6]

Regarding the timing of rescanning, on the basis of literature and of our small experience, the most appropriate

timing for rescanning seems to be, as still reported by Bhandari[1] *et al*., at the third week of IMRT course, although Yan *et al*., in a recent paper, indicated that the most appropriate replanning time is after 20 fractions of treatment.[7]

Finally, a controversial and still open issue concerns if a new dosimetric study is always necessary for all HN cancer patients. Capelle *et al*.[8] showed little benefit in replanning in definitive treatment, and none in adjuvant setting.

In conclusion, because "adaptive" RT remains extremely time-consuming, as stated by Yan *et al*.,[7] "criteria are urgently needed for determining which patients need replanning during IMRT and when," based on a larger sample of HN cancer patients.

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