

Letter to the Editor

Comments on the Publication by Corkum et al on “Does 5 + 5 mm Equal Better Radiation Treatment Plans in Head and Neck Cancers?”



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To the Editors,

This retrospective planning study addresses the issue of gross tumor volume (GTV) to clinical target volume (CTV) margins in head and neck squamous cell carcinoma in light of the recently published international guidelines recommending the use of a 5 + 5 mm GTV to CTV margin with corrections for anatomy.¹ Based on an evaluation of dose distribution in a series of 108 plans, the authors conclude that with the use of a CTV-P1 of 5 mm around the primary tumor GTV and a PTV of 5 mm around the CTV, the addition of a CTV-P2 had no dosimetric impact, added complexity to the treatment planning, and could even introduce treatment errors.²

We are writing to question the reasoning behind these conclusions, which mixes concepts of microscopic tumor cell infiltration (what is called the CTV) and geometric and beam delivery uncertainties (what is called the PTV). In the past, when 2-dimensional radiation therapy was performed and when patients with head and neck cancer were treated with parallel-opposed fields, these concepts, although already defined by the International Commission on Radiation Units and Measurements, were not

implemented. In the modern era, head and neck radiation oncology has evolved, and introducing confusion between the definitions of CTV and PTV in 2019 is unacceptable.

As defined by the International Commission on Radiation Units and Measurements, the CTV concept was introduced to take into account microscopic infiltration around the GTV (eg, “a volume of tissue that contains a demonstrable GTV and/or subclinical malignant disease with a certain probability of occurrence considered relevant for therapy”³). In the field of head and neck squamous cell carcinoma, recent data on pathologic analysis of tumor specimens have shown that tumor cell infiltration was typically observed within 7.8 to 12 mm from the GTV border and that 90% to 95% of infiltration was within the first 5 mm (see Grégoire et al¹). In the absence of a biological model describing the exact probability of microscopic infiltration as a function of the distance from the GTV edge, it was proposed that the situation be simplified, with 2 CTVs defined around the GTV, each with a different dose prescription.

The PTV is a concept that only integrates the positioning uncertainties, which is also materialized by adding a margin. Typically, in the majority of centers, a CTV to PTV margin of around 4 to 5 mm is used.⁴ Whereas the CTV is not influenced at all by the irradiation technique, the PTV heavily depends on the patient positioning accuracy, internal motion of the CTV,

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beam type (eg, photons vs protons), beam energy (which may influence the penumbra), and use of adaptive treatment. It is likely that in the foreseeable future, with refinement in patient positioning and beam delivery and the daily use of adaptive treatment, the CTV to PTV margin may be reduced to 2 mm (corresponding to the residual positioning error) on a routine basis.

It may also be that in the future the margins around the GTV will combine multiple uncertainties, including the clinical, geometric, and delivery uncertainties, on an individual patient basis to guide the dose distribution. In the meantime, a clear distinction should be maintained between the conceptual formalisms of CTV and PTV. For instance, this distinction is very important with the advent of robust optimization for particle therapy wherein a PTV is not used but the CTV must be specified. That said, based on settings used in a particular center, the intensity modulated radiation therapy dose distribution obtained without delineating a second CTV may by chance reach a clinically acceptable level, but this should not be considered a standard clinical practice that can be recommended on a large scale. A less rigorous standard

would permit further variation in dose prescription across institutions, which has already been identified as a major source of quality deficiency.⁵

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