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Adequate Reporting Standards Are Required to Study the Reirradiation Treatment Effects in the Clinic (ReTEC)

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Abstract
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Abstract

Objectives:

Clinical need and utilization of reirradiation are increasing rapidly in the international radiation oncology community but the therapeutic index in this new paradigm is poorly understood due to the complex and multi-faceted nature of the current treatment process, and due to the limited reporting of details in the published data. Numerous clinical reports have been published on reirradiation, focusing on tissue tolerance, cumulative dose and dose distribution, but the time recovery factors for organs at risk are not yet well quantified and the data severely lack detail. As such, a large-scale collaborative project is needed, like the recently completed HyTEC project. The HyTEC project was initially conceived out of the need for detailed data to construct TCP and NTCP models for SBRT. About 90% of the existing NTCP models for SBRT were published during the HyTEC project itself, showing that sparsity of data should not be the reason to prevent the project; sparsity of solid data is the very reason that the proposed Reirradiation Treatment Effects in the Clinic (ReTEC) project is necessary and timely.

Methods:

Registries such as RSSearch, as well as electronic appendices in the published literature, can be powerful tools to warehouse complete datasets to enable pooled analysis for a project like ReTEC. Because Registries, Retrospective series, and even Prospective Reports often lack adequate necessary information for TCP and NTCP analysis, we propose the following data elements to be included for each contoured organ and tumor for each patient:

(1) Dose
(2) Fractionation
(3) Volume
(4) Endpoints including the tumor control rate and graded toxicities
(5) Follow-up time
(6) Incidence of the endpoints occurring within the follow-up time, and identification of potential contributing factors
(7) Time interval between each treatment
(8) Dosimetric information on prior treatments

For a single course of treatment, dose and volume information can be conveniently reported in terms of a dose-volume histogram (DVH). For reirradiation however, the entire 3D dose distribution and contours will be needed for each patient because hot spots may be in different locations in different courses of treatment due to the heterogeneity in dose distribution in each course. PubMed searches (for (bowel OR skin) AND reirradiation) were conducted to accumulate data for preliminary models to start the Reirradiation Treatment Effects in the Clinic (ReTEC) project.

Results:

After an extensive search, no papers were found that included the desirable level of detail, despite having already screened more than 200 journal papers on reirradiation, however some initial estimates can be gleaned from these papers. For example, a study of 23 pelvic and thoracic patients by investigators at

Erasmus MC suggested a dose reduction recovery factor of 25% or 50% for a re-irradiation 6 or 12 months after the last radiation (Radiotherapy Oncol. 2011 May;99(2):235-9) and encountered low rates of bowel and skin grade 3 and no grade 4 toxicity. Another example includes a study by Fuller et al on reirradiation SBRT for prostate cancer local recurrence where no rectal toxicity higher than grade 2 was observed following a median interval of 8 years following the prior radiation (Int J Radiat Oncol Biol Phys. 2020 Feb 1;106(2):291-299). This demonstrates feasibility but the full dose distribution and time interval for many patients will be needed to construct TCP and NTCP models to fully exploit time recovery to optimize the outcomes.

Conclusion(s):

Hundreds of papers have shown the feasibility of reirradiation, but recovery factors and as they relate to the maximal safe reirradiation dose over time are not yet known. Therefore, a large-scale collaborative effort like ReTEC is needed to study reirradiation tissue effects in the clinic. This presentation will show the practical initial steps that are being taken.