
Salvage re-irradiation for local failure of prostate cancer after curative radiotherapy: dosimetric and radiobiological modelling of rectal toxicity

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Résumé

Introduction: To assess the impact of radiation dose and clinical parameters on rectal toxicity following salvage external beam radiation therapy (EBRT) with or without a brachytherapy (BT) boost for exclusive local failure after primary-EBRT for prostate cancer.

Materials and Methods: Fourteen patients with no residual toxicity after primary EBRT (\pm BT) were re-irradiated after a median time interval of 6.1 years (4.7-10.2). The median NTD2Gy was 74Gy (66-98.4) at primary-RT and 85.1Gy (70-93.4) at re-irradiation. Rectal dose volume histograms of both treatments (converted to NTD2Gy) and the corresponding normal-tissue-complication-probability (NTCP) values for gastro-intestinal (GI) toxicity were calculated.

Results: The 5-year Grade ≥ 3 GI toxicity-free survival rate was $57.1 \pm 13.1\%$. Five patients developed Grade 4 GI toxicity. Rectal V70Gy and the maximum dose to 1cc of rectum at primary EBRT were both predictive for Grade ≥ 3 GI toxicity; 12.2% vs. 3.8%, $p=0.042$ and 72.2 Gy vs. 66.8 Gy, $p=0.0027$, respectively. When adding primary-RT and re-irradiation plans, the median maximum dose to 1cc of rectum was 139.8 Gy (126.7-147.8) vs. 125.9 Gy (99.1-133.1) ($p=0.0063$) for Grade ≥ 3 and Grade ≤ 2 GI toxicity groups. Higher NTCP values at primary-RT were predictive for Grade ≥ 3 toxicity ($p < 0.05$).

Conclusions: A higher rectal NTCP value, even in the absence of high-grade late-toxicity after primary-RT, is correlated with an increased risk of severe rectal side-effects after salvage re-irradiation. Rectum doses greater than 70Gy at primary-RT, and NTCP values of more than 10%, might predict for grade ≥ 3 rectal toxicity at re-irradiation, with a possible threshold for total rectum dose of around 130Gy.

Mots-Clés: Reirradiation, late toxicity, NTCP, dosimetry, prostate cancer.

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