

Radiotherapy in Early Breast Cancer: Optimizing Patient Selection from Trials and Guidelines

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Abstract

Background: Adjuvant radiotherapy (RT) after breast-conserving surgery (BCS) reduces ipsilateral breast tumor recurrence (IBTR), but the absolute benefit varies with baseline risk. With modern systemic therapy and molecular profiling, a subset of patients has sufficiently low local-recurrence risk to consider RT de-escalation or omission.

Methods: We analyzed evidence from randomized trials in older, hormone-receptor-positive (HR+) early breast cancer, prospective cohort studies and current guidelines. Key outcomes were IBTR, distant relapse, overall survival (OS), and toxicity/quality-of-life (QoL).

Results: Two randomized trials validate RT omission in elderly, low-risk HR+ disease

receiving endocrine therapy. CALGB 9343 (age ≥ 70 , T1N0, ER+) showed higher 10-year IBTR with omission ($\approx 10\%$ compared with 2% with RT) without OS difference. PRIME II trial (age ≥ 65 , ER+, ≤ 3 cm, N0) confirmed as a $9\text{--}10\%$ absolute increase in 10-year IBTR without OS loss. Biologically selected cohorts suggest omission can transcend age criteria. For women ≥ 55 years with luminal A tumors (ER+, HER2–, grade 1–2, Ki-67 $\leq 13.25\%$) who are treated with endocrine therapy alone in the LUMINA trial, 5-year locoregional recurrence was $\sim 2\text{--}3\%$ with great distant control without RT. On-going randomized trials as PRECISION and EXPERT are comparing genomic testing such as Oncotype DX, Prosigna/PAM50 to guide RT omission.

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Randomized and prospective data support RT in most DCIS, yet small, low-grade, wide-margin screen-detected lesions of low risk could be suitable for surveillance or surgery alone. Active-surveillance trials are also underway on this topic. On the other hand, de-escalation alternatives like ultra-hypo fractionated whole-breast RT and partial-breast irradiation have local control with reduced burden of treatment.

Conclusions: RT omission is safe for carefully selected elderly patients with small, node-negative, ER+ tumors on endocrine therapy, with no OS penalty. Biology and genomics can further help in patients' selection. Shared decision-making, adherence to endocrine therapy and multidisciplinary review are essential.

Keywords: radiotherapy, early breast cancer, guidelines