Accelerated partial breast irradiation for early breast cancer: current status and future trends

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Several randomized phase III studies have demonstrated that whole breast irradiation (WBI) following breast-conserving surgery (BCS) provides equivalent locoregional control and overall survival (OS) in patients with early-stage breast cancer (EBC) when compared with those undergoing radical mastectomy. Conventionally, WBI is delivered in daily doses of 46–50 Gy in 23–25 fractions for several weeks. During the past decade, several randomized trials have revealed that delivering hypofractionated WBI using doses of 40–42.5 Gy in 15–16 fractions resulted in similar locoregional control and cosmetic events in EBC patients when compared with conventional WBI. Although the Early Breast Cancer Trialists' Collaborative Group (EBCTCG) revealed that WBI can provide a 10-year absolute decreased local recurrence of 15.7% and decreased breast cancer mortality of 3.8% compared with BCS alone for patients with EBC. Some patients, for example, those aged ≥ 70 years with estrogen receptor (ER)-positive EBC, developed a lower local recurrence rate but survival was not affected after undergoing BCS alone. Considering that most patients who underwent BCS alone developed local recurrence in areas neighboring the cavity of lumpectomy obtained from randomized trials, these rationales may allow radiation oncologists to test the hypothesis that accelerated partial breast irradiation (APBI) can be delivered exclusively to a limited volume of breast tissue closing the lumpectomy cavity in a short duration of treatment in an attempt to diminish the toxicities of normal breast tissue, lung, and heart from therapy.

In this report, the eligibility criteria, dose, volume, radiotherapy technique, including brachytherapy and external beam radiation therapy (EBRT), ipsilateral breast tumor recurrence (IBTR), and OS of APBI from four large, randomized trials have been summarized. This includes the UK IMPORT LOW trial, Canadian RAPID trial, the NSABP B-39/RTOG 0413 study, and GEC-ESTRO trial, and the other three single institutional randomized trials, namely NIO Hungary, Barcelona, and Florence trials. These studies demonstrated that among the over 10,000 patients with EBC randomized to WBI or APBI, and who received follow-up for more than five years, those undergoing APBI had non-inferior results in terms of IBTR, OS, and quality of life when compared with those receiving WBI. The long-term IBTR and OS of two randomized trials was also described, in which patients underwent intraoperative radiotherapy (IORT) with electron, ELIOT trial, or 50-KV photon, TARGET-A trial. Considering that eight randomized trials showed that APBI using EBRT, multicatheter brachytherapy, and IORT with electron therapy resulted in equivalent efficacies in local control, disease-free survival, and OS in patients with EBC, the application of APBI using the

aforementioned radiotherapy techniques as an alternative therapy can be considered for selected low-risk EBC patients, such as those >50 years old with a hormone-receptor-positive small lymph node-negative tumor, but without histological evidence of extensive intraductal components, lymphovascular invasion, and multiple foci tumors.