

ACCELERATED PARTIAL BREAST IRRADIATION VS WHOLE BREAST IRRADIATION-PROSPECTIVE COMPARATIVE STUDYRajeswaran A¹, Poonkodi N², Ravi Shankar G³¹Assistant Professor, Department of Surgical Oncology, Stanley medical college, Tamilnadu, India²Associate Professor, Department of Radiation Oncology, Stanley Medical College, Tamilnadu, India³Assistant Professor, Department of General Surgery, Tirupur Medical College, Tamilnadu, IndiaReceived : 02/01/2024
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Accepted : 04/03/2024**Keywords:***Breast cancer, breast-conserving therapy, accelerated partial breast irradiation, whole-breast irradiation, local recurrence, histopathology.*

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2025; 7 (1); 86-89**Abstract**

Background: Breast conservation therapy (BCT), comprising breast-conserving surgery (BCS) followed by radiation therapy, is the standard treatment for early-stage breast cancer. Whole-breast irradiation (WBI) is widely practiced but requires an extended treatment duration, whereas accelerated partial breast irradiation (APBI) offers shorter treatment times. Comparative data on recurrence and other clinical outcomes between APBI and WBI are limited, particularly in India. This study aimed to compare the local recurrence rates and histopathological characteristics between APBI and WBI within one year among patients undergoing BCS. **Materials and Methods:** This prospective study was conducted at Govt Royapettah Hospital, Kilpauk Medical College, Chennai, from July 2019 to April 2021. Twenty patients underwent BCS and were allocated to the APBI (n=5) or WBI (n=15) groups according to the American Society for Radiation Oncology (ASTRO) guidelines. Follow-up was conducted every three months with clinical examinations and annual mammograms. **Result:** Among the APBI patients, 4 (80%) had no recurrence, while 15 (100%) of the WBI patients were recurrence-free (p = 0.076). Histologically, invasive ductal carcinoma (IDC) was more common in the WBI group (93.3% vs. 40%; p = 0.029). Node-negative status (p = 0.020) and grade 1 tumours (p = 0.035) were significantly higher in the APBI group. Both groups demonstrated no significant differences in cancer staging (p = 0.718) or BI-RADS scores (p = 0.606). **Conclusion:** APBI demonstrated comparable local control to WBI within the one-year follow-up, with potential advantages in terms of treatment duration. Larger, long-term studies are required to validate these findings.

INTRODUCTION

Breast cancer is the most frequently diagnosed cancer in women and surgery is the primary treatment modality. Till the mid-20th century radical mastectomy remained the mainstay of surgical therapy.^[1,2] Breast-conserving surgery (BCS) followed by radiation therapy to the intact breast is now accepted as the standard of care for the majority of women with early-stage invasive breast cancer (stage I and II breast cancer).^[3-5] Breast-conserving therapy offers an obvious cosmetic advantage that may enhance quality of life and reduce psychological and emotional treatment-related distress.^[6,7] The Breast conservation therapy approach consists of lumpectomy followed by 5-7 weeks of daily whole breast irradiation (WBI), where a total dose of 45-50 Gy is delivered to the entire breast in 25 fractions over 5 weeks followed by an optional boost of 10-20 Gy.^[8,9] Based on the benefit and radio-biological

effectiveness observed with hypofractionation, the concept of Accelerated Partial Breast Irradiation (APBI) was designed to irradiate the tumour bed only with a margin, as the majority of the recurrences were observed within 2 cm of the tumour bed. In APBI, radiation is delivered to the breast tissue around the lumpectomy cavity within 4-5 days rather than irradiation of the whole breast in 5-6 weeks. The total dose of 34-38.5Gy is delivered in 10 fractions at larger doses per fraction.^[10,11]

Several groups have studied the status of evidence for Accelerated Partial Breast Irradiation and have produced consensus statements and recommendations as to who should be treated with APBI after lumpectomy until the effects from clinical trials are known.^[12-14] The choice of treatment among accelerated partial breast irradiation and whole breast irradiation is dependent on various factors such as benefit and radio-biological effectiveness, side effects due to radiation toxicity, cosmetic advantage,

and, more importantly, tumour recurrence. There are very few studies available on this topic comparing the recurrence of tumours in Breast conservation surgery patients undergoing accelerated partial breast irradiation and whole breast irradiation, especially in the Indian context.^[15-17]

Aim: To determine the local recurrence rate between whole-breast irradiation (WBI) and Accelerated Partial Breast Irradiation (APBI) due to 1-year recurrence among breast carcinoma patients treated with breast conservation therapy.

MATERIALS AND METHODS

This prospective comparative study included 20 patients admitted to the surgical oncology department of Govt Royapettah Hospital, Kilpauk Medical College, a tertiary care hospital in Chennai, during the study period from July 2019 to April 2021. Follow-up was performed as per NCCN guidelines with physical examination once every 3 months and mammography once a year to detect local recurrence.

Inclusion criteria

All patients who underwent breast conservation surgery were included, with those eligible for Accelerated Partial Breast Irradiation (APBI) according to ASTRO guidelines receiving radiation exclusively via brachytherapy. Patients not meeting the criteria for APBI were included for whole breast irradiation, which was accompanied by a tumor bed boost administered through interstitial brachytherapy. Eligibility for APBI was defined as patients aged over 50 years, with pathologically node-negative status (pN0), no family history of breast or ovarian cancer, and resection margins greater than 2 mm. Additional criteria included negative axillary lymph nodes, unifocal tumours, non-lobular histology, tumor size less than 3 cm, absence of lymphovascular invasion, ER-positive status, and ductal carcinoma in situ (DCIS) of low or intermediate grade. For DCIS, the size had to be < 2.5 cm with a resection margin greater than 3 mm.

Exclusion criteria

Patients not eligible for breast conservation surgery and bilateral BCS were excluded.

Study procedure

Informed written consent was obtained from the study participants after explaining the purpose, procedure, risks, and benefits of the study in a language that they could best understand. The study did not change any intervention or treatment outcome. Institutional ethics committee approval was obtained prior to the start of the study.

Breast conservation surgery was done with a 1 cm margin, and the margin status was confirmed using frozen sections. If the frozen section was positive, an excision was performed. Excision was performed until the acquiring margin was negative. Patients who underwent BCS were as per the criteria assigned to either APBI or WBI. In both arms, a brachial catheter was inserted in the operating room with strict aseptic precautions. Postoperatively, all patients received

interstitial brachytherapy on postoperative day 3. The dosage and schedule are listed in Table 1.

All patients were administered chemotherapy according to the current guidelines of the medical oncologists. Hormonal therapy was initiated according to hormonal receptor status after chemotherapy. All patients were reviewed monthly after the completion of therapy. Follow-up was performed as per NCCN guidelines with physical examination once every 3 months and mammography once a year to detect local recurrence. Every year, a contralateral screening mammogram was performed.

Statistics analysis: The data were coded, entered into Microsoft Excel, and analysed using SPSS version 16 for proportions and frequencies. Baseline patient characteristics, tumour characteristics, histopathological characteristics, and recurrence were compared between the two groups whole WBI and APBI by using the chi-square test.

RESULTS

Of the 20 patients, five (25%) satisfied the specified criteria for APBI, and the remaining 15 (75%) patients were included in the WBI [Figure 1].

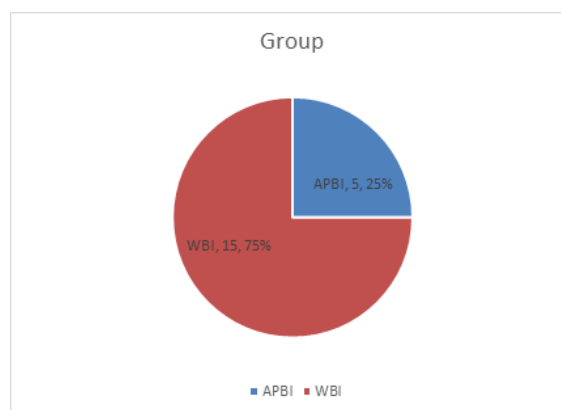


Figure 1. Distribution of study groups

Histopathological presentations among the groups Among the patients with APBI, two (40%) had cancer on the left side and three (60%) on the right side. In the WBI group, 7 (46.7%) patients had left-sided cancer and 8 (53.3%) had right-sided cancer. There was no significant difference in laterality between groups ($p = 0.795$). Ductal carcinoma in situ (DCIS) was significantly more frequent in the APBI group (60%) compared to the WBI group (6.7%). Invasive ductal carcinoma (IDC) was more common in the WBI group (93.3%) than in the APBI group (40%) ($p = 0.029$).

The proportion of grade 1 tumours was significantly higher in the APBI group (100%) than in the WBI group (46.7%) ($p = 0.035$). No significant differences were observed in the BI-RADS scores between the groups. BI-RADS 4 was present in 40% of the APBI group and 53.3% of the WBI group, whereas BI-RADS 5 was observed in 60% and 46.7% of patients, respectively ($p = 0.606$).

Stage 1 was observed in 20% of the APBI group and 13.3% of the WBI group, while Stage 2 was present in 80% and 86.7%, respectively, with no significant difference between the groups ($p = 0.718$). Node-negative status (node 0) was significantly more frequent in the APBI group (100%) than in the WBI group (40%) ($p = 0.020$) [Table 2].

Recurrence: Among the 5 undergone APBI, four (80%) did not have recurrence, and among the 15 patients who underwent WBI, 15 (100%) did not have recurrence. This difference was not statistically significant ($p = 0.076$). One study subject who underwent APBI and had recurrence was further treated with Modified Radical Mastectomy. Recurrence among the study groups is shown in [Figure 2].

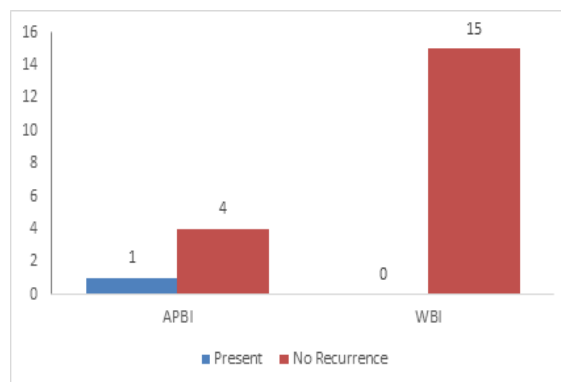


Figure 2. Distribution of recurrence

Table 1: Radiation dose, fractions, and duration.

	Radiation dose & fractions	Total dose	Duration
5 patients (APBI)	3.5 Gy/fractions (2 fractions/day -6 hours apart) (To Tumour bed)	17.5 Gy	3 days
15 patients	3.5 Gy/fractions (2 fractions/day-6 hours apart) (To Tumour bed) +1.3 Gy /fraction 25 fractions – 1 fraction /day	17.5Gy +32.5Gy =50 Gy	3 days +25 days

Table 2: Histopathological presentations among the groups

		Groups		Total	p-value
		APBI	WBI		
Side	Left	2	7	9	0.795
	Right	3	8	11	
Histology	DCIS	3	1	4	0.029
	IDC	2	14	16	
Grade	1	5	7	12	0.035
	2	0	8	8	
BIRADS	4	2	8	10	0.606
	5	3	7	10	
Stage	1	1	2	3	0.718
	2	4	13	17	
Node	0	5	6	11	0.020
	1	0	9	9	

DISCUSSION

Breast conservation surgery is the standard of care for early breast carcinoma; however, brachytherapy can be used in centres where linear accelerators are unavailable. In this study, Patients who underwent BCS were as per the criteria and assigned either APBI or WBI. The study comprised a total of five (25%) patients with APBI and the remaining 15 (75%) patients with WBI. Histologically, IDC was significantly higher in the WBI group, and grade 1 and node 0 were significantly higher in the APBI group. Follow-up was performed as per NCCN guidelines with physical examination once every 3 months and mammography once a year to detect local recurrence. Among the 5 undergone APBI, four (80%) did not have recurrence, and among the 15 patients who underwent WBI, 15 (100%) did not have recurrence.

The choice of management between APBI and WBI depends on various factors such as radio-biological effectiveness, side effects due to radiation toxicity, cosmetic advantages, and more importantly, tumour

recurrence. In this study, among the 15 patients who underwent WBI, 15 (100%) did not have recurrence, but the single patient with recurrence in the APBI group was further managed with Modified Radical Mastectomy. Sher et al. performed a Cost-Effectiveness Analysis to compare partial breast irradiation with whole-breast irradiation for the treatment of early stage breast cancer over a 15-year follow-up period. They observed that the PBI was the most cost-effective procedure over a wide range of assumptions and societal willingness-to-pay values.^[18]

Wadasadawala et al. conducted a case-control study to compare disease control, cosmesis, and complications between accelerated partial breast irradiation and conventional whole-breast radiotherapy in the management of early breast cancer. This study was conducted in Mumbai from May 2000 to December 2004. They observed no differences in overall survival (OS), late arm oedema, disease-free survival (DFS), or symptomatic fat necrosis between the two groups. They observed that APBI offered better overall cosmetic outcomes.^[19]

Meattini et al., in their study, observed that the ipsilateral tumour recurrence rate after 10 years in patients with early breast cancer who were treated with APBI is not significantly different from patients treated with WBI. 20 5-year results of a randomised, phase 3 trial by Schäfer et al., Quality-of-life results for accelerated partial breast irradiation with interstitial brachytherapy were same when compared with whole-breast irradiation.^[20,21] Chen et al., studied the Long-term cosmetic results and toxicity after accelerated partial-breast irradiation and observed mild chronic toxicity and cosmesis was good to excellent in 95–99% of patients.^[22]

A major limitation of this study is that because of low accrual and corona pandemic, both the patients attending the seeking treatment and hospitals offering elective surgeries were limited, and the study was closed early and analysed with a smaller sample size of 20 patients. While the majority of the studies have followed up over a longer period, the follow-up period in this study was less.

CONCLUSION

Among the 5 undergone APBI, four (80%) did not have recurrence, and among the 15 patients who underwent WBI, 15 (100%) did not have recurrence, and this difference was significantly different. Considering factors such as radiobiological effectiveness, APBI can be considered non-inferior to WBI.

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