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Interstitial HDR Brachytherapy in BCT: A Case Series Study from a Single Institute.

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ABSTRACT

Background: Radiotherapy (RT) plays an integral part in the management of breast cancer. In BCT there is 20% reduction in loco regional failure and 15 years breast cancer mortality reduction by 5% when RT is used as adjuvant therapy. Adjuvant radiation therapy can be delivered by External Beam Radiotherapy (EBRT) with brachytherapy (BT) or BT alone. Aims: Loco regional control of disease with good cosmesis. Primary end point is loco regional failure. **Methods**: A total of 30 cases of early breast cancers (T1, T2 N0M0) treated during May 2008 to Dec 2012 and followed up till July 2015 were studied. External radiation dose of 45 to 50 Gy by Telecobalt-60 followed by boost implant BT with dose of 15 to 20Gy in 3 to 4 fractions was used (BED = 84.4 ± 1.1 Gy) for combined external plus BT as per departmental protocol. A total of 30 Gy in 6 fractions was used (BED = 47.8 Gy) for BT alone as per departmental protocol. Ir-192 Micro selectron HDR rigid needle template or flexible catheter implant to primary site was used. Dosimetry was done with Plato sunrise treatment planning System. **Results**: Age ranges from 23 to 50 years. Median follow up was 54 months. None had local recurrence. Only 1 had mild needle wound sepsis and all had good to excellent acceptable cosmetic results. Radiation skin reaction and sub cutaneous fibrosis were grade I and 2. Three had disease recurrence at distant sites and one patient had moderate telangiectasia at the irradiated site. **Conclusion**: BCT with EBRT and HDR BT boost or HDR BT alone has shown good results in both loco regional control of disease with good to excellent cosmesis.

Keywords: BCT; Implant brachytherapy; cosmesis.

INTRODUCTION

Radiotherapy plays an integral role in the management of breast cancer. It can be given as External Beam Radiotherapy (EBRT) with Brachytherapy (BT) or BT alone. Over the last decades, breast conservative surgery followed by whole breast irradiation (WBI) with boost to primary site became the standard of care for the treatment of early stage breast cancer.[1] The use of whole-breast irradiation (WBI) after breast conservative surgery has shown to reduce the risk of ipsilateral breast tumour recurrence compared to breast conservative surgery alone. The majority of local recurrences after breast conservative surgery are at or near the lumpectomy site.[2] When RT is used as an adjuvant therapy after BCT, there is 20% reduction in locoregional failure. This translates into 15 years breast cancer mortality reduction by 5%.[3] BT is used as an adjuvant therapy in BCT either alone or combined with external radiotherapy to boost the primary site provided the facility and expertise is available at the treating centre. Many centers use RT and alternative boost technique like IMRT, Electron beam, coned downed photon, TARGIT or non-radiation local treatment like cryotherapy,RFA ablation, focussed US etc. specially where BT facility is unavailable or thought to be invasive in nature. But many studies reported BT to be superior, and technique not a difficult one to master. Besides BT has the added advantage of partial breast irradiation (PBI) sparing lots of normal tissue from unnecessary irradiation with shortened duration of treatment.[4-6] With this background, our experience in the long term follow-up are discussed.

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In BCT besides organ preservation, cosmesis is considered an important factor.[5,7] Hence in this study, we are evaluating both the response and the cosmetic results with the use of HDR BT as a part of adjuvant treatment of early breast cancer treated routinely at Regional Cancer Centre, RIMS, Imphal.
Aims: Locoregional control of disease with good cosmesis in BCT with the use of implant HDR BT. Primary end point of study is locoregional relapse.

MATERIAL AND METHODS

A total of 30 cases of early breast cancers treated for Breast Conservative Treatment and who met the following criteria: (i) tumour size < 4cm, (ii) negative surgical margin, (iii) depth from skin surfave > 1cm (iv) N0, M0 (v) suitable breast anatomy for implantation, and (vi) full recognition of possible increased risk of local failure; were included in this study during the period from May 2008 to December 2012. The patients were followed up till July 2015, at the Department of Radiotherapy, RIMS, Imphal. Patients with invasive lobular histology, extensive intraductal carcinoma, or multifocality were excluded. It was then followed within 3 to 6 weeks by boost implant with Ir-192 pellet source using Micro Selectron HDR Brachytherapy (Nucletron). Brachytherapy was planned using PLATO Sunrise treatment planning system. Technique used was rigid needle double planer template implant in 29 cases, and flexible catheter single plane implant in 1 case to the primary site all under short general anesthesia. Treatment doses of 15 to 20 Gy in 3 to 4 fractions with 6 hour gap was delivered following to EBRT dose of 45-50 Gy in 18-20 fraction. The total biological effective dose (BED) delivered was 84.4 ± 1.1 Gy (range 83.6 - 85.2 Gy) and 30Gy in 6 fractions when BT alone is used (BED = 47.7 Gy).[10]

Patients were followed every 3 months in the OPD, Dept of RT, RIMS, during the first 1 year after treatment and every 6 months thereafter with physical examination, chest radiography, ultrasound whole abdomen and routine blood investigations. Baseline mammography was performed at 6 months after the completion of treatment and yearly thereafter. Local recurrence was defined as the recurrence of cancer in the treated breast proven histologically. The actuarial rate of local recurrence was estimated from the date of surgery using the Kaplan-Meier method. The cosmetic evaluation was based on the standards set forth in the Harvard criteria, which consisted of a four tiered grading system: excellent, good, fair, and poor.[3] Late toxicity of the skin and subcutaneous tissue was scored according to the Radiation Therapy Oncology Group (RTOG)/European Organization for Research and Treatment of Cancer late radiation morbidity scoring scheme.[4,6]

RESULTS

The median patient age was 42 years (range 23 to 50 yrs). Histological subtypes were invasive ductal carcinoma in 26 (86.6%) patients, medullary carcinoma in 2 (6%), ductal carcinoma in situ in 2 (6%). Pathological T classification was Tis in 3 (10 %), T1 in 17 (56.6%), and T2 in 10 (33.3%). The pathological resection margin was clear (≥ 0.2 cm) in 26 (86.6%) and close (> 0, < 0.2 cm) in 4 (13.3%) patients.

Table 1: Patient tumor and treatment characteristics.

Age	**Range** **Median**	**23 – 50 yrs** **42 yrs**
Tumor size (cm)	Range Median	0.5 – 3.5 2
T Stage	Tis T1 T2	3(10%) 17(56.6%) 10(33.3%)
N Stage	N0 N1	18(60%) 12(40%)
Histological Subtype	Invasive ductal ca Medullary carcinoma Ductal Carcinoma in situ	26 (86.6%) 2 (6%) 2 (6%).
Hormone Receptor	ER + and PR + ER + and PR – ER – and PR –	24(80%) 2(6.6%) 4(13.3%)
Resection Margin	Clear (≥ 0.2 cm) Close (>0, < 0.2 cm)	26 (86.6%) 4 (13.3%)

All the patients underwent BCS with gross total resection of the primary tumor and level I/II axillary clearance (n= 26, 86.6%) and sentinel node biopsy (n=4, 13.3%). Lumpectomy (n = 28, 96.6%), quadrantectomy (n=1, 3.33%) and wide excision (n=1, 3.33%) were performed for the primary breast lesions. After receiving complete histological reports, 27 patients received external radiation therapy up to a dose of 45 to 50 Gy in 18-20 fraction with Cobalt-60 (Theratron-780C) to whole breast. 3 patients received implant brachytherapy only 30Gy in 6 fractions.

Age of the patients ranges from 23 years to 50 years, with the median age of 42 years. The median follow up period was 54 months (range - 30 months to 78 months). Most of the patients were of the younger age groups which indicate aggressive disease. One of the patient have needle wound sepsis which was managed successfully with conservative treatment without any serious sequelae, with local dressing and oral antibiotic. All had good to excellent acceptable cosmetic results.

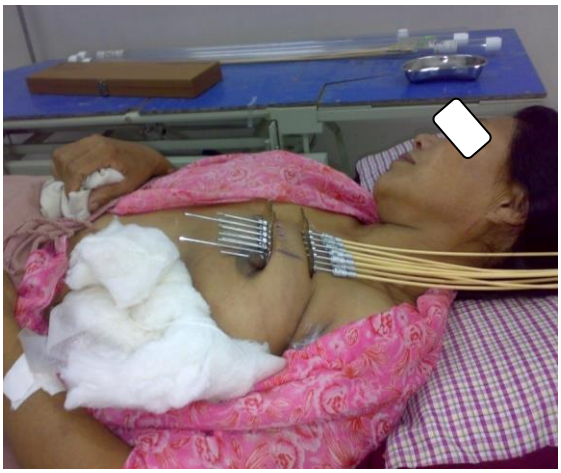

Figure 1: Patient receiving interstitial HDR brachytherapy.

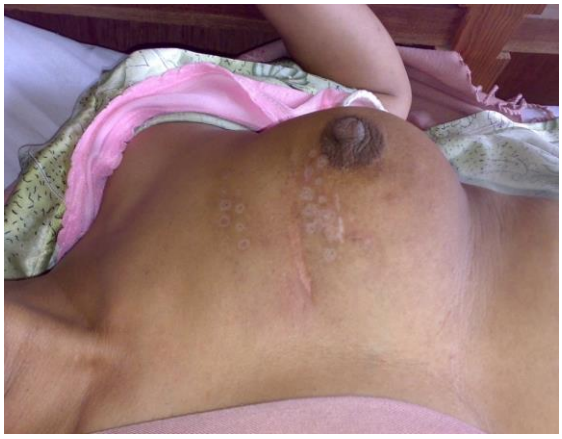

Figure 2: Post treatment showing good cosmetic result.

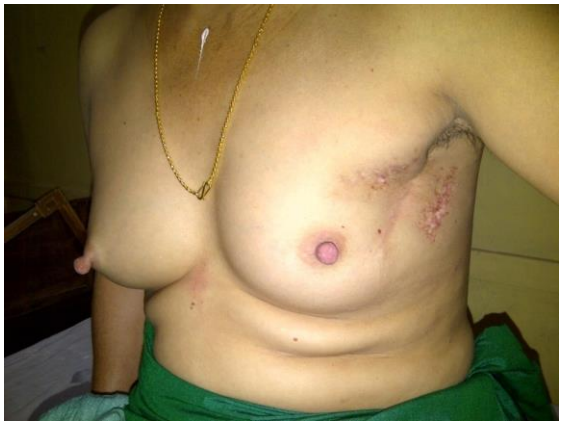

Figure 3: Post RT telangiectasia.

Early side effects were usually mild and the breast pain, edema, or erythema subsided with conservative management. Grade 1 and grade 2 late skin toxicity occurs in 5 (16.6%) and 2 (6.6%) patients, respectively. Grade 1 and 2 late subcutaneous toxicity developed in 4 (13.3) and 3 (10%) patients, respectively. At the end of 48 months, 1 person developed mild telangiectasia at the irradiated site, 3 patients had disease recurrence at distant sites including liver and lung, but none at the primary disease site. So, the primary end point of the disease has not reached yet.

DISCUSSION

Ir192 HDR implant BT boosting as part of adjuvant RT for BCT is practiced in many centres where expertise is available. In our centre we performed HDR BT as adjuvant to BCS or boosting when combined with EBRT whenever suitable case is available. The results of analysis of the 30 cases shows the procedure is safe, easy to master though minimally invasive and results in terms of local control and cosmetic effects are highly satisfactory. Our results are comparable to other technique of adjuvant RT boosting viz. balloon mamosite, electron beam, coned down photon etc.[13-15] We use template BT and hence the maintenance of geometry and dose calculation is easier and more accurate. The only disadvantage is it needs some training which is not difficult one and is minimally invasive. Otherwise it is an effective and safe procedure as evidenced by the fact that we don't encounter any serious adverse effect.

While the technique of Rigid-template implant is easy to master and perform the issue to be addressed for implant BT is in selecting the suitable patient, delineating the CTV (Clinical Target Volume), dose optimisation and prescription.[10] Once these issues are addressed then the implant technique and execution is easy. In our series it is found that a pre implant consultation with the physicist yields better dose distribution then trying to rectify the cold and hot spots by using optimisation techniques of dwell time and position. Dose constraints if any for skin cosmesis is a major factor then the cumulative skin dose is tailored accordingly. For lesions very superficial and resection margin very close to skin, cosmesis may be sacrificed. In our cases, this is not required as majority had sufficient tumour depth to spare skin. For a start-up new radiotherapy centre with Brachytherapy, the following above steps and guidelines as done in our centre if followed,[12-14] the failure and complication rate will be very low. Even if a failure occurs we can treat and salvage as if we are treating the case de novo.[8,12,15]

In the series presented, we follow the guidelines and select suitable patients only and it will be the reason for encountering no local failure after > 5 years F.U. (for early Breast Cancer this may not be adequate to call long term). Hence, the series study confirms that Brachytherapy is a satisfactory option for local control of disease in BCT.

CONCLUSION

BCT and EBRT with HDR boost Bt or adjuvant BT alone has shown good results both in locoregional control of the disease and excellent cosmesis to our patients. No locoregional failures were recorded till the time of reporting this data. The technique is minimally invasive and not difficult to master. The whole procedure is affordable and acceptable to the patients.

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