

**American College of Radiology  
ACR Appropriateness Criteria®**

**Clinical Condition:**

**Postmastectomy Radiotherapy**

**Variant 1:**

**50 years of age, infiltrating ductal carcinoma, S/P modified radical mastectomy, 1.5 cm UOQ, margins (-), 4/15 LNs (+). No BVI or LVI, no metastasis, systemic treatment planned (type undecided). ER/PR, Her2, and menopause status will not alter treatment options.**

| Treatment   | Rating | Comments  |
|---|--------|---|
| <b>Principles of Treatment (Volumes)</b>                            |        |   |
| Chest wall RT   | 9      |   |
| Supraclavicular fossa/level III axilla RT                           | 9      |   |
| Supraclavicular fossa and level I-III axilla RT                     | 3      |   |
| Internal mammary node RT  | 7      |   |
| Central chest wall boost  | 8      | Boost may be appropriate, as indicated by risk of residual microscopic disease relative to the radiation dose achieved with comprehensive chest wall irradiation. |
| <b>Chest Wall RT (Doses)</b>  |        |   |
| 50-50.4 Gy in 25-28 fractions                                       | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Supraclavicular Fossa/Axillary RT (Doses)</b>                    |        |   |
| 45-50.4 Gy in 25-28 fractions                                       | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>IMN Chain RT (Doses)</b>   |        |   |
| 50 Gy in 25 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Chest Wall Boost RT (Doses)</b>                                  |        |   |
| 10-16 Gy in 5-8 fractions   | 9      |   |
| <b><u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate</b> |        |   |

**Clinical Condition:****Postmastectomy Radiotherapy****Variant 2:**

50 years of age, grade 3 infiltrating ductal carcinoma, S/P modified radical mastectomy, tumor is 3.5 cm UOQ, margins (-), 0/15 LNs (+). No BVI or LVI, no metastasis, systemic treatment planned (type undecided). ER/PR, Her2, and menopause status will not alter treatment options.

| Treatment   | Rating | Comments |
|---|--------|----------|
| <b>Principles of Treatment (Volumes)</b>  |        |          |
| Chest wall RT   | 1      |          |
| Supraclavicular fossa/level III axilla RT   | 1      |          |
| Supraclavicular fossa and level I-III axilla RT   | 1      |          |
| Internal mammary node RT  | 1      |          |
| Central chest wall boost  | 1      |          |
| <b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate |        |          |

**Variant 3:**

50 years of age, postmenopausal woman with infiltrating ductal carcinoma, S/P modified radical mastectomy, 6.5 cm UOQ, margins (-), 0/15 LNs (+), ER/PR (+), Her2 (-). No BVI or LVI, no metastasis, systemic treatment planned (type undecided).

| Treatment   | Rating | Comments  |
|---|--------|---|
| <b>Principles of Treatment (Volumes)</b>  |        |   |
| Chest wall RT   | 7      | Recommendation to treat is individualized and based on patient age, tumor grade, margin status and +/- LVI.   |
| Supraclavicular fossa/level III axilla RT   | 5      |   |
| Supraclavicular fossa and level I-III axilla RT   | 1      |   |
| Internal mammary node RT  | 5      | There may be circumstances where nodal radiation is appropriate, depending on optimal chest wall coverage relative to the primary tumor position.                 |
| Central chest wall boost  | 7      | Boost may be appropriate, as indicated by risk of residual microscopic disease relative to the radiation dose achieved with comprehensive chest wall irradiation. |
| <b>Chest Wall RT (Doses)</b>  |        |   |
| 50-50.4Gy in 25-28 fractions  | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Supraclavicular Fossa/Axillary RT (Doses)</b>  |        |   |
| 45-50.4 Gy in 25-28 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>IMN Chain RT (Doses)</b>   |        |   |
| 50 Gy in 25 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Chest Wall Boost RT (Doses)</b>  |        |   |
| 10-16 Gy in 5-8 fractions   | 9      |   |
| <b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate |        |   |

**Clinical Condition:****Postmastectomy Radiotherapy****Variant 4:**

54 years of age, postmenopausal woman, infiltrating ductal carcinoma, S/P modified radical mastectomy, 1.5 cm UOQ, margins (-), 2/15 LNs (+), ER/PR (+), Her2 (-). No BVI or LVI, no metastasis, systemic treatment planned (type undecided).

| Treatment   | Rating | Comments  |
|---|--------|---|
| <b>Principles of Treatment (Volumes)</b>  |        |   |
| Chest wall RT   | 7      |   |
| Supraclavicular fossa/level III axilla RT   | 7      |   |
| Supraclavicular fossa and level I-III axilla RT   | 3      |   |
| Internal mammary node RT  | 7      |   |
| Central chest wall boost  | 7      | Boost may be appropriate, as indicated by risk of residual microscopic disease relative to the radiation dose achieved with comprehensive chest wall irradiation. |
| <b>Chest Wall RT (Doses)</b>  |        |   |
| 50-50.4Gy in 25-28 fractions  | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Supraclavicular Fossa/Axillary RT (Doses)</b>  |        |   |
| 45-50.4 Gy in 25-28 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>IMN Chain RT (Doses)</b>   |        |   |
| 50 Gy in 25 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Chest Wall Boost RT (Doses)</b>  |        |   |
| 10-16 Gy in 5-8 fractions   | 9      |   |
| <b>Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate</b> |        |   |

**Clinical Condition:****Postmastectomy Radiotherapy****Variant 5:**

50 years of age, postmenopausal woman, infiltrating ductal carcinoma, S/P modified radical mastectomy, 6.5 cm UOQ, margins (-), 2/15 LNs (+), ER/PR (+), Her2 (-). No BVI or LVI, no metastasis, systemic treatment planned (type undecided).

| Treatment   | Rating | Comments  |
|---|--------|---|
| <b>Principles of Treatment (Volumes)</b>  |        |   |
| Chest wall RT   | 9      |   |
| Supraclavicular fossa/level III axilla RT   | 9      |   |
| Supraclavicular fossa and level I-III axilla RT   | 3      |   |
| Internal mammary node RT  | 8      |   |
| Central chest wall boost  | 8      | Boost may be appropriate, as indicated by risk of residual microscopic disease relative to the radiation dose achieved with comprehensive chest wall irradiation. |
| <b>Chest Wall RT (Doses)</b>  |        |   |
| 50-50.4Gy in 25-28 fractions  | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Supraclavicular Fossa/Axillary RT (Doses)</b>  |        |   |
| 45-50.4 Gy in 25-28 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>IMN Chain RT (Doses)</b>   |        |   |
| 50 Gy in 25 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Chest Wall Boost RT (Doses)</b>  |        |   |
| 10-16 Gy in 5-8 fractions   | 9      |   |
| <b>Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate</b> |        |   |

**Clinical Condition:****Postmastectomy Radiotherapy****Variant 6:**

40 years of age, premenopausal woman with infiltrating ductal carcinoma, S/P modified radical mastectomy, 3.5 cm UOQ, positive deep margins (tumor at ink), 0/15 LNs (+). No BVI or LVI, no metastasis, systemic treatment planned (type undecided).

| Treatment  | Rating | Comments |
|--|--------|----------|
| <b>Principles of Treatment (Volumes)</b>   |        |          |
| Chest wall RT  | 9      |          |
| Supraclavicular fossa/level III axilla RT  | 2      |          |
| Supraclavicular fossa and level I-III axilla RT  | 1      |          |
| Internal mammary node RT   | 2      |          |
| Central chest wall boost   | 9      |          |
| <b>Chest Wall RT (Doses)</b>   |        |          |
| 50-50.4Gy in 25-28 fractions   | 9      |          |
| 37.5 Gy in 16fractions   | 6      |          |
| <b><u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate</b> |        |          |

**Clinical Condition:****Postmastectomy Radiotherapy****Variant 7:**

50 years of age, infiltrating ductal carcinoma, S/P modified radical mastectomy, with immediate reconstruction, no BVI or LVI, no metastasis, systemic treatment planned (type undecided), 3.5 cm left UOQ, margins (-), 4/15 LNs (+), post level I-II dissection. ER, PR, Her2 and menopausal status will not alter treatment recommendations.

| Treatment   | Rating | Comments  |
|---|--------|---|
| <b>Principles of Treatment (Volumes)</b>  |        |   |
| Chest wall RT   | 9      |   |
| Supraclavicular fossa/level III axilla RT   | 9      |   |
| Supraclavicular fossa and level I-III axilla RT   | 3      |   |
| Internal mammary node RT  | 7      |   |
| Central chest wall boost  | 8      | Boost may be appropriate, as indicated by risk of residual microscopic disease relative to the radiation dose achieved with comprehensive chest wall irradiation. |
| <b>Chest Wall RT (Doses)</b>  |        |   |
| 50-50.4Gy in 25-28 fractions  | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Supraclavicular Fossa/Axillary RT (Doses)</b>  |        |   |
| 45-50.4 Gy in 25-28 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>IMN Chain RT (Doses)</b>   |        |   |
| 50 Gy in 25 fractions   | 9      |   |
| 37.5 Gy in 16 fractions   | 6      | In selected cases may be appropriate.   |
| <b>Chest Wall Boost RT (Doses)</b>  |        |   |
| 10-16 Gy in 5-8 fractions   | 9      |   |
| <b>Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate</b> |        |   |

**Clinical Condition:****Postmastectomy Radiotherapy****Variant 8:**

45 years of age, with diffuse suspicious calcifications, positive for DCIS, S/P simple mastectomy, no invasive carcinoma, but diffuse high-grade comedo DCIS with a positive deep margin (tumor at ink). Sentinel node at the time of mastectomy was negative.

| Treatment   | Rating       | Comments  |
|---|--------------|---|
| <b>Principles of Treatment (Volumes)</b>  |              |   |
| Chest wall RT   | No consensus | Chest wall irradiation may be indicated, depending on tumor grade, histology and the patient's age. |
| Supraclavicular fossa/level III axilla RT   | 1            |   |
| Supraclavicular fossa and level I-III axilla RT   | 1            |   |
| Internal mammary node RT  | 1            |   |
| Central chest wall boost  | No consensus | Boost is considered appropriate if a decision to treat is made.                                     |
| <b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate |              |   |

**Variant 9:**

40 years of age, S/P mastectomy and sentinel node for multifocal invasive breast cancer, no focus greater than 1.0 cm. Sentinel node frozen section was negative, but the permanent section shows a focus of metastasis (<2 mm). Completion level I/II axillary dissection demonstrates no further tumor in nine lymph nodes. Cytotoxic chemotherapy is planned. ER/PR (-), IHC only (+).

| Treatment   | Rating | Comments |
|---|--------|----------|
| <b>Principles of Treatment (Volumes)</b>  |        |          |
| Chest wall RT   | 1      |          |
| Supraclavicular fossa/level III axilla RT   | 1      |          |
| Supraclavicular fossa and level I-III axilla RT   | 1      |          |
| Internal mammary node RT  | 1      |          |
| Central chest wall boost  | 1      |          |
| <b>Rating Scale:</b> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate |        |          |

# POSTMASTECTOMY RADIOTHERAPY

Expert Panel on Radiation Oncology–Breast: Marie E. Taylor, MD<sup>1</sup>; Bruce G. Haffty, MD<sup>2</sup>; Rachel Rabinovitch, MD<sup>3</sup>; Douglas W Arthur, MD<sup>4</sup>; Francine E. Halberg, MD<sup>5</sup>; Eric A. Strom, MD<sup>6</sup>; Julia R. White, MD<sup>7</sup>; Melody A. Cobleigh, MD<sup>8</sup>; Stephen B. Edge, MD.<sup>9</sup>

## **Summary of Literature Review**

This summary focuses on the role of postoperative radiation therapy in patients treated with modified radical mastectomy for invasive breast cancer, particularly in patients receiving systemic therapy. Patients treated with mastectomy for T4, pN3, or clinically node-positive disease is addressed in the ACR Appropriateness Criteria<sup>®</sup> for “[Locally Advanced Breast Cancer](#)”. Neither radical mastectomy nor simple mastectomy without axillary dissection is in widespread use in the United States; hence the results of studies conducted on such patients will not be reviewed here. (These have been summarized elsewhere [1-5]).

### **Local-Regional Failure Rates in Unirradiated Patients**

In series with median lengths of follow-up of 5 years or longer, local-regional failure occurs at the first site of failure in approximately 15%-20% of node-negative [6-10] and 25%-40% of node-positive patients [6,11-15] with early-stage breast cancer who do not receive systemic therapy. Tumor size [16-23], the number of positive lymph nodes [16,19-21,24-29], lymphovascular space invasion [17,22,23,25,27,30], tumor grade [18,19,22,23,27,29], and the distance of tumor from the pectoralis fascia [18,23,31,32] or involvement of the fascia and skin [33] can influence the likelihood of such recurrences.

Several recent reports confirm the interaction of tumor size, tumor grade, lymphovascular space invasion, surgical margin status, skin involvement, number of involved lymph nodes, number of lymph nodes sampled, and patient age as compounding factors that determine the risk of local-regional recurrence [17,18,20-23,25,30,33]. Long term local-regional failure rates in patients with locally advanced tumors may be 40% or higher [34].

The chest wall is the site at greatest risk for local-regional recurrence [20,33,35]. The risk of regional nodal recurrence varies with the size of the primary tumor, whether axillary nodes are involved, the number of nodes sampled, the number involved, and by the type of axillary dissection used [18,20,21,29,36,37]. The impact of sentinel node biopsy on local-regional recurrences remains uncertain and will be established with the results from ongoing clinical trials addressing this aspect of treatment outcome. With standard axillary procedures, axillary recurrences are rare following removal of level I and II nodes, when nodes are negative or there are only one to three positive nodes. Nodal relapse in undissected level III lymph nodes and supraclavicular fossa is the second most common type of regional failure. However, such failures are more common in patients with four or more positive nodes [18,20,21,33,38].

The presence of extracapsular nodal extension was associated with a higher risk of distant failure [18,39-43] in some series, with no difference noted in local-regional recurrence. Huang et al reported an association of extracapsular extension with an increased risk of local-regional failure by multivariate analysis [33]. Garg et al [44] reported that extracapsular extension was associated with a 29% risk of local-regional recurrence vs 9% if absent (P=.0834). Clinical recurrences in internal mammary lymph nodes are rare [35].

The impact of chemotherapy on local-regional failure rates has varied among randomized trials involving patients with positive nodes. Some have shown substantial proportional reductions in such failure rates, one-third to one-half lower than the incidence in the control arms [9,12,14,15], but others have shown little to no reduction [10,13,45]. Tamoxifen has been shown to improve local-regional recurrence rates when used for treatment of estrogen receptor (ER)-positive disease [11,44].

### **Randomized Studies of Postmastectomy Irradiation and Risk of Local-Regional Recurrence**

Postmastectomy irradiation reduces the risk of local-regional recurrence (LRR) as documented by innumerable trials over the last several decades. A meta-analysis by the Early Breast Cancer Trialists' Collaborative Group (EBCTCG) [46] included 78 prospective randomized trials investigating the value of postsurgical irradiation. The 5-year local recurrence risk was 6% with postmastectomy irradiation and 23% without, providing a risk reduction of 74%. The addition of postmastectomy irradiation provided similar proportional reductions in local recurrence in all patients regardless of age or tumor characteristics, and in all the major trials of irradiation vs no irradiation (recent or older, with or without the use of systemic therapy). Large absolute reductions in local recurrence were seen only if the control risk was large.

Many of the trials included in the EBCTCG analysis, however, did not irradiate the area at highest risk of LRR,

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