

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

Clinical Condition:

Locally Advanced Breast Cancer

Variant 1:

45-year-old premenopausal female, 4.5 cm IDC left breast, ER/PR (-), Her2 amplified, PET (+) in breast, axilla and medial infraclavicular fossa. Palpable nodes in high axilla. Metastatic workup negative. Patient desires breast conservation.

Treatment	Rating	Comments
Principles of Treatment		
Initial chemotherapy	9	
Breast conservation therapy (BCT) if \geq PR to chemotherapy	8	For some patients with less than PR, breast conservation may be appropriate if surgically feasible.
Initial mastectomy and axillary dissection	1	N3 status contraindicates initial surgical approach.
Initial BCT and axillary dissection	1	
Radiation Volumes (assume initial chemotherapy followed by BCT, clear margins, and axilla dissection level I-II, 8/16 LN+, highest node+)		
Whole breast only \pm boost (no nodal RT)	1	
Partial breast irradiation (no nodal RT)	1	
Whole breast and supraclavicular + apical axillary nodes	9	
Whole breast and supraclavicular LNs and full axilla	7	Probably not required after a standard axillary dissection.
Internal mammary nodes (assumes breast RT given concurrently)	8	Provided caution is taken to minimize cardiac pulmonary volumes.
Boost infraclavicular region	8	Boost determined by extent of surgical resection and clinical features.
Radiation Doses (1.8–2.0 Gy/day unless specified otherwise) (assume initial chemotherapy followed by BCT, clear margins, and axilla dissection level I-II, 8/16 LN+, highest node+)		
Whole breast: 42.5 Gy (16 fractions)	1	
Whole breast: 45-50 Gy	9	
Total dose to breast tumor bed: 45-50 Gy	1	
Total dose to breast tumor bed: 60-66 Gy	9	
Total dose to supraclavicular fossa and axillary apex: 45-50 Gy	9	
Total dose to supraclavicular fossa and axillary apex: 60 Gy	1	
Total dose to medial infraclavicular nodes: \geq 60Gy	8	Gross tumor may require higher doses. Higher doses risk brachial plexus. CT planning recommended.
Full axilla: 45-50 Gy	7	
IMN: 45-50 Gy	7	
<u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate		

Clinical Condition:

Locally Advanced Breast Cancer

Variant 2:

40-year-old woman, 4 cm primary with diffuse suspicious microcalcifications in breast, direct skin invasion, satellite skin nodule, matted axilla (N2), ER (+)/PR (-), Her2 (-). Metastatic workup negative.

Treatment	Rating	Comments
Principles of Treatment		
Initial chemotherapy	9	
Mastectomy if response to initial chemotherapy	9	
Initial endocrine therapy	2	Only if cytotoxic therapy contraindicated or on a clinical trial.
Initial surgery	1	
Initial breast and nodal RT	1	
BCT if response to initial chemotherapy	1	
Radiation Volumes (assume chemotherapy, mastectomy, axillary dissection level I-II, 3/16 LN+)		
Chest wall only ± boost (no nodal RT)	1	
Chest wall, supraclavicular and apical nodes	9	
Chest wall, supraclavicular fossa + full axilla	7	
Internal mammary nodes (assumes chest wall RT)	8	
Boost to chest wall	9	
Radiation Doses (1.8–2.0 Gy/day unless specified otherwise) (assume chemotherapy, mastectomy, clear margins, and axilla dissection level I-II, 3/16 LN+)		
Chest wall: 45-50 Gy	9	
Total dose to chest wall including boost: 60-66 Gy	9	
Supraclavicular and axillary nodes: 45-50 Gy	9	
Full axilla: 45-50 Gy	7	
IMN: 45-50 Gy	7	
Rating Scale: 1=Least appropriate, 9=Most appropriate		

Clinical Condition:

Locally Advanced Breast Cancer

Variant 3:

80-year-old woman, 4 cm primary, direct skin invasion, satellite nodule, matted axilla (N2), strongly ER/PR (+), Her2 (-). Metastatic workup negative. Medically fit.

Treatment	Rating	Comments
Treatment Modalities		
Initial endocrine therapy	9	Both are considered equally appropriate.
Initial chemotherapy	9	Both are considered equally appropriate.
Initial surgery	1	
Initial breast and nodal RT	1	
Rating Scale: 1=Least appropriate, 9=Most appropriate		

Variant 4:

50-year-old woman, T3N2M0 disease, with clinical CR post 4-cycle multidrug chemotherapy. ER/PR (-), Her2 (-). Does not desire BCT.

Treatment	Rating	Comments
Treatment Modalities		
Mastectomy and axillary dissection	9	
Additional chemotherapy	9	Would complete all chemotherapy up front. Depends on what drugs are used.
Postmastectomy RT	9	
No surgery: RT + chemotherapy	1	
Rating Scale: 1=Least appropriate, 9=Most appropriate		

Clinical Condition:

Locally Advanced Breast Cancer

Variant 5:

38-year-old woman, T4 inflammatory, N1 disease, no response post 3-cycle multidrug chemotherapy. ER/PR (-), Her2 (-). Metastatic workup negative.

Treatment	Rating	Comments
Principles of Treatment		
Change chemotherapy; if no response, proceed to RT	9	
Change chemotherapy; if response, mastectomy	9	
Change chemotherapy; if no response, pre-op chemoradiation (radiosensitizing chemotherapy)	7	
Immediate mastectomy/axillary dissection	1	
Radiotherapy (assume sufficient response to be operable with clear margins)		
Standard fractionation (1.8-2.0 Gy)	9	
Accelerated fractionation (1.5 Gy BID)	7	
Dose to central chest wall: 45-50 Gy	9	
Total dose to chest wall including boost: 60-66 Gy	9	
Rating Scale: 1=Least appropriate, 9=Most appropriate		

Variant 6:

42-year-old woman, T2N1 (clin), M0 left breast cancer, Her2 amplified. Status post mastectomy with 11/12 (+) nodes and reconstruction plus chemotherapy, no evidence of disease. Will receive trastuzimab for one year.

Treatment	Rating	Comments
Principles of Treatment		
Chest wall RT	9	
Supraclavicular RT	9	
Attempt to exclude all heart from RT volume	9	
Full axilla RT	7	
IMN RT	7	
RT dose adjustment (decrease) due to reconstruction	5	
Discontinue trastuzimab during radiotherapy	1	
Rating Scale: 1=Least appropriate, 9=Most appropriate		

Clinical Condition:**Locally Advanced Breast Cancer****Variant 7:**

57-year-old woman, triple negative IDC, status post-mastectomy: 3.5 cm inner quadrant primary, 7/12 LN (+). Focally positive deep margin. PET (+) IMC and S/C nodes. Adjuvant anthracycline and taxane, with normalization of PET findings. Metastatic workup negative.

Treatment	Rating	Comments
Radiation Volumes		
Chest wall only ± boost	1	
Supraclavicular + apical nodes (assumes chest wall RT also)	9	
Full axilla (assumes chest wall RT also)	7	
Internal mammary nodes (assumes chest wall RT)	9	
Boost to IMC	8	
Boost supraclavicular nodes	8	
Radiation Doses		
Total dose to chest wall including boost: 45-50 Gy	1	
Total dose to chest wall including boost: 60 Gy	2	
Total dose to chest wall including boost: 64-66 Gy	9	Clinical circumstance may require higher dose.
Total dose to supraclavicular fossa including boost: 45-50 Gy	9	
Total dose to supraclavicular fossa including boost: 60-66 Gy	9	
Total dose to entire IMN chain: 45-50 Gy	9	
Total dose to entire IMN chain: 60-66 Gy	9	
Rating Scale: 1=Least appropriate, 9=Most appropriate		

Variant 8:

55-year-old woman with neglected primary. Large, fungating lesion and matted axilla. ER (-) /PR (+), Her2 (-). Metastatic workup negative. Not operable after three chemo regimens, including anthracyclines and taxanes.

Treatment	Rating	Comments
Principles of treatment		
Switch to endocrine therapy	9	
Switch to 4 th line chemotherapy	3	Appropriate in phase I clinical trial.
Debulking surgery with anticipated + margins	3	
Palliative radiation (30-45 Gy)	No consensus	May be appropriate in selected clinical circumstances.
Concurrent chemoradiation	No consensus	May be appropriate in selected clinical circumstances.
Preoperative RT (50-54 Gy)	No consensus	May be appropriate in selected clinical circumstances.
Definitive RT to ≥70 Gy	No consensus	May be appropriate in selected clinical circumstances.
Rating Scale: 1=Least appropriate, 9=Most appropriate		

LOCALLY ADVANCED BREAST CANCER

Expert Panel on Radiation Oncology–Breast: Eric A. Strom, MD¹; Tse-Kuan Yu, MD, PhD²; Rachel Rabinovitch, MD³; Bruce G. Haffty, MD⁴; Francine E. Halberg, MD⁵; Marie E. Taylor, MD⁶; Julia R. White, MD⁷; Melody A. Cobleigh, MD⁸; Stephen B. Edge, MD.⁹

Summary of Literature Review

The treatment of locally advanced breast cancer (LABC) must include two major goals: control of locoregional disease and eradication of occult systemic metastases. The patterns and risk of locoregional recurrence after mastectomy are functions of the size of the primary tumor, the degree of regional nodal involvement, the presence or absence of skin or chest wall involvement, and the type of surgical procedure performed.

In this document, LABC is defined as clinical T3, T4, N2, or N3 disease. Patients with LABC have historically had a poor prognosis, and some are initially inoperable. They include patients with evidence of involvement of the second-echelon nodal basins of the infraclavicular [1], supraclavicular [2], and internal mammary lymph nodes. Some of these features represent a change from the previous American Joint Committee on Cancer (AJCC) staging system. A clinically distinct, but similarly high-risk entity is inflammatory breast cancer. Overall, locally advanced breast cancer is very heterogeneous, with highly variable tumor sizes and nodal status. This definition was chosen in a way to integrate with the ACR Appropriateness Criteria[®] on “[Local Regional Recurrence and Salvage Surgery](#)” and the ACR Appropriateness Criteria[®] on “[Postmastectomy Radiotherapy](#)” topics. The discussion for this topic will be limited to prevent significant overlap with the other two criteria.

The staging for LABC patients should include a mammogram as for all breast cancer patients. Because of the high probability for metastatic disease, imaging such as bone scan, computed-tomography (CT) of the upper abdomen and chest radiograph is useful. Various imaging modalities have been used including CT, ultrasound (US), and positron-emission tomography (PET)–to assess the

local and regional extent of disease, including the draining nodal beds [3-6], although there is not universal agreement on which of these modalities may be preferred. Certainly as a principle, careful radiologic imaging of the both the breast and the several nodal basins is critical to the accurate staging and optimized management of advanced breast cancer. US-guided fine-needle aspiration has been used as well to assess the architecture of abnormal lymph nodes and confirm the presence of small-volume tumor by cytology [7].

Bloom et al [8] reporting the outcome of untreated patients with breast cancer, found a median survival time of 2.7 years. The median 5-year overall survival (OS) rate was 18%, and the median 10-year OS rate was 4%. Local therapy improved on these numbers in many cases, even in patients with advanced breast cancer. After Haagensen and Stout [9] showed no benefit with radical mastectomy in patients with skin ulceration, skin edema (peau d’orange) or erythema, satellite skin nodules, or fixation to the chest wall musculature, only patients with operable disease were treated by mastectomy, with or without radiotherapy, while inoperable disease was treated by radiotherapy alone [10-12]. Most of the patients succumbed due to distant metastases. However, there were still 20%-50% 5-year survivors when the patients were treated using definitive radiation with various systemic adjuvant chemotherapies [13-17]. The local control in these patients ranged from 50%-70%.

For operable patients undergoing mastectomy without irradiation, certain subgroups at higher risk for recurrence were identified. The clinical and pathologic status of axillary nodes was found to be an important indicator of the risk of both subsequent local recurrence (LR) and distant metastasis (DM) [18,19]. Patients having 4 or more nodes involved at mastectomy had locoregional recurrence rates (LRR) of 22%-38% and were at significant risk of locoregional recurrence regardless of the primary tumor size [9,11,20,21]. Increasing number of involved lymph nodes is a powerful predictor of locoregional recurrence and metastasis. Recognizing this, the 2002 update of the AJCC staging system now classifies the involvement of 4-9 axillary nodes as N2(p) and the involvement of ≥ 10 nodes as N3(p).

In attempts to improve survival and local-regional control (LRC), adjuvant radiation was initially added to definitive surgeries [2,22,23]. With this combination of therapies, Strom et al [24] reported 10-year LRC of 82% and a 10-year disease-specific, recurrence-free survival rate (DSRFS) of 40%. Even after adjuvant radiation, a higher number of involved axillary lymph nodes predicted worse LRC and DSRFS. In the study by Toonkel et al [23] definitive surgery rather than lesser surgeries was needed, along with adjuvant radiation, to have better OS, RFS, and LRC. Initial mastectomy is not indicated in patients with stage IIIB disease [9] and should be avoided in lower stages of disease unless the tumor can be completely

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resected. The value of subtotal tumor excision has not been demonstrated.

Combined Modality Therapy–Mastectomy

The earliest reports of induction chemotherapy were published in the 1970s. The sequence of treatment has varied; mastectomy often precedes other therapy for operable patients [25-27], although many institutions have preferred to use preoperative systemic or radiation therapy (RT) or both [28-30]. Randomized trials and the Oxford meta-analysis have shown that adjuvant systemic therapy has resulted in lower recurrence rates and increased survival [31].

In the most recent Oxford meta-analysis, the addition of RT also showed significant improvement in overall survival [32]. However, the trials in the meta-analysis included mostly early breast cancer patients. Few randomized studies have evaluated only stage III disease, and these have mostly excluded patients with inoperable disease.

Trials comparing the combination of chemotherapy with either RT or surgery as local monotherapy in patients with advanced breast cancer have reported high (25%-30%) local recurrence rates [13,33-36]. Retrospective studies suggested that better LRC and DFS results were obtained with trimodality therapy than with any other combination of therapies [34,37-43]. In Huang et al, patients who received neoadjuvant chemotherapy with mastectomy alone were compared with those who also received post-mastectomy RT [44]. Over 67% of patients were stage III in the study. In multivariate analysis, adjuvant RT independently contributed to better LRC and cause-specific survival. Even when patients achieved pathologic complete response after neoadjuvant chemotherapy, there was a high rate of LRR (33% at 10 years). The addition of RT further reduced that rate to 3% at 10 years. In a small group of patients who were inoperable and resistant to anthracycline-based chemotherapy, preoperative irradiation was able to convert over 80% of patients to operable status and allow them to undergo mastectomy [44]. Nearly half of these patients were alive at 5 years, with 64% local control.

In 1997, the Eastern Cooperative Oncology Group (ECOG) reported the results of its trial of postmastectomy locoregional RT in technically resectable, locally advanced breast cancer. All 312 patients received chemohormonotherapy consisting of CAFTH for 6 cycles. The patients were then randomized to adjuvant RT or delayed RT until LRR. The patients in the adjuvant RT arm had lower LRR (15% vs 24%), but higher DM (50% vs 35%) as first site of failure compared to the patients in the delayed RT arm. The study population had high competing risk for DM. There was not difference in OS rate or time to overall relapse. Of note, 30 of 164 patients in the adjuvant RT arm did not actually receive radiation; 11 of these patients had LRR as first site of failure [45].

A randomized trial in stage III breast cancer patients from Helsinki has clearly shown the efficacy of combining all three therapeutic modalities of surgery, chemotherapy,

and RT. In this trial, 120 patients with stage IIIA breast cancer were randomized to one of three arms after modified radical mastectomy: locoregional irradiation alone, systemic VAC chemotherapy (with or without levamisole), or both VAC and irradiation. At both 3- and 5-years, RT reduced local failures relative to the chemotherapy arm, whereas VAC reduced the number of distant failures. The best DFS and local control rates were seen in the combined-modality arm [46].

In the Danish Breast Cooperative Group trials (82b and 82c), adjuvant RT improved overall survival in patients who underwent modified radical mastectomy and, systemic CMF (premenopausal) or tamoxifen (postmenopausal) [47,48]. However, in those studies, only 12%-14% of the studied patients had T3 primary tumors or skin invasion and unspecified patients and clinical N2 or N3 disease. Similarly, the British Columbia randomized trial that showed improved LRC and breast-cancer-specific survival with the addition of adjuvant RT to modified radical mastectomy and CMF, had very few locally advanced breast cancers [49]. Therefore, interpretation of those results to locally advanced breast cancer is difficult.

Based on the above studies as well as the other studies previously mentioned, it appears that surgery and RT produced essentially equivalent local control rates when used alone with systemic therapy, but these control rates are only in the range of 60%-70%, whereas when they were used together, superior local control rates of 80%-90% can be achieved. This multidisciplinary approach to locally advanced breast cancer renders most patients local regionally disease free [50].

Combined-Modality Therapy–Breast-Preserving

Breast preservation is feasible in certain LABC patients. Those with clinical N2/N3 disease and small primary tumors, whose nodal disease responds to neoadjuvant chemotherapy, should be offered breast-preserving therapy. Using neoadjuvant chemotherapy, many patients with T3 disease can be downstaged. Those patients who respond well to chemotherapy should also be offered breast-preserving therapy if the resection can achieve negative resection margins while maintaining cosmetically acceptable breasts [44,51-60]. These studies suggest that up to one-quarter of patients with advanced breast cancers can be offered breast preservation, but that appropriate patient selection is key. For patients with T4 disease, breast conservation should be offered as part of study protocol, although a small study suggested its feasibility [61]. In the U.S., initial chemotherapy is probably the most common approach to inoperable LABC, with response rates an important factor in predicting local control [58,62,63] irrespective of the type of surgery required to resect the disease.

There have been some attempts to forgo surgery for patients who responded well to neoadjuvant chemotherapy or hormonotherapy [34,40]. In the study by Pierce et al, only RT was given to those patients who achieved clinical complete response and whose breast-

biopsy was negative [34]. There was a trend for worse LRC in RT-alone group compared to those who also had mastectomy and radiation. Therefore, this strategy should still be considered investigational.

High-Dose Chemotherapy with or without Bone Marrow/Stem Cell Support

The use of high-dose alkylating agent combination and autologous bone marrow transplantation and/or hematopoietic growth factor, and stem cell support for extremely high-risk patients such as those with 10 or more positive axillary nodes or inflammatory breast cancer, is becoming increasingly common. Dose-intensive programs may lead to further improvements in survival of selected patients with this disease [64,65]. However, published reports have shown that local recurrence is still a major problem in those patients not receiving locoregional irradiation. Peters and Marks [65,66] have reported the Duke University experience with this therapy and noted a 30% locoregional recurrence rate if RT was not included as part of the treatment regimen. They now recommend that all patients receive local RT as part of the planned course of treatment. Using combined-modality treatment with neoadjuvant chemotherapy followed by surgery, high-dose chemotherapy with stem cell support, and finally RT, high rates of local regional control may be achieved in high-risk patients with no extraordinary radiation toxicity [67,68].

Inflammatory Breast Cancer

Inflammatory breast cancer is seen in a small subset of patients, but is still a very aggressive disease with worse prognosis than other locally advanced breast cancers [69]. Before the era of systemic chemotherapy, 5-year survival rates were in the range of only 5% [11]. Since the use of induction chemotherapy, 5-year survival figures have risen to 30%-50% [64,70,71].

Trimodality therapy should be considered in inflammatory breast cancer patients, since all patients in this group are at very high risk of locoregional recurrence and DM. Although mastectomy in this patient group is generally considered to be contraindicated, reports have shown an improvement in local control when mastectomy was added, but only in patients who have good response to preoperative chemotherapy [72,73]. Several series have shown improved LRC and DFS rates in the patients receiving all three treatment modalities, but no significant difference in survival [73,74]. However, Fields et al [75] reported significantly improved LRC and OS rates for patients receiving surgery as part of initial treatment: LRR (19% vs 70%, $P<0.0001$) and 5-year OS (37% vs 7%, $P=0.0004$). This may have been a reflection of the favorable outcome of patients who respond to chemotherapy, because other series have shown that the initial responders will also have the best survival rates. For instance, Hennessey et al [76] reported 5-year OS of 83% in patients with pathologic complete disease remission in the axillary lymph nodes, while the same rate dropped to 37% if tumor was still detected in the lymph nodes after chemotherapy.

When combined modalities were used, high rates of LRC could be reached. Liao et al [62] reported 5-year LRC of 73% in patients who received chemotherapy, mastectomy, and RT. There were still high rates of DM and mortality, with OS of 40% and DFS of 32% at 5 years. Interestingly, dose escalation with accelerated hyperfractionation (BID) seemed to provide improved OS and LRC.

It is important to read the literature carefully to determine whether patients with locally advanced noninflammatory cancers are included with those with inflammatory disease, or whether the patient group includes those with secondary: inflammatory changes that develop after a tumor has been present for some time (frequently more than one year) and eventually invade the skin. Such patients tend to have a more indolent course than those presenting with “classic” inflammatory disease; the “classic” presentation is associated with a rapid growth history and a tendency to involve large areas of skin and the dermal lymphatics. Studies tend to show better treatment results for those types of patients than for those who are confined to the subgroup with classic inflammatory breast cancer, and should be interpreted accordingly [64].

Timing, Techniques, Treatment Modalities under Study

The optimal timing of RT in patients treated with combined modality as above has not been established by the available data. While many institutions are delivering locoregional RT sequentially after completion of adjuvant systemic chemotherapy, which can be eight or more months postmastectomy, there are several favorable reports about using RT (usually with concurrent chemotherapy) early in the patient’s treatment course. No study specifically compares these approaches in locally advanced breast cancers. In early-stage breast cancer, sequential therapy has been preferred for avoiding treatment delays or dose reduction due to synergism of acute toxicities.

Preoperative RT with chemotherapy radiosensitizer has been studied in several small prospective studies [77-81]. Formenti et al [37] reported overall response rates of 91% to preoperative RT to 45 Gy with concurrent paclitaxel. Sixteen percent of patients achieved pathologic complete response. The toxicities in this study appeared to be tolerable. However, this strategy should be examined further under protocol, since in other studies radiation-induced pneumonitis rates of up to 25% were observed when paclitaxel was given concurrently with RT [14,82]. When adjuvant RT was given sequentially after paclitaxel, however, there seemed to be no increased development of clinically relevant radiation pneumonitis [83]. The use of concurrent chemoradiation for breast cancer is an area of active clinical investigation.

Hyperthermia has also been studied to enhance radiation effects in locally advanced and recurrent breast cancer [84-87]. In Welz et al [87] 50 patients with microscopically involved resection margin were treated with radiation to a median dose of 60 Gy and

hyperthermia (>41 degrees C for 60 minutes). They observed the 3-year OS and LC rates to be 89% and 80%, respectively, with 28-month median follow-up. Many of the patients in these studies developed toxicities since they were reirradiated with hyperthermia. Likewise, patients who were treated with neutron-based therapy experienced a high rate of long-term toxicity including ulceration and brachial plexopathy [88].

The details of the several radiation techniques used to treat breast cancer after mastectomy are discussed in the ACR Appropriateness Criteria® on “[Postmastectomy Radiotherapy](#)” topic. In the major randomized trials of postmastectomy RT for intermediate-stage breast cancer, the targets of treatment, which represent the areas at risk for recurrence, have included nodal volumes (supraclavicular, axillary, and internal mammary) [47,89,90] and the chest wall. In LABC, treatment planning should take into account the detailed distribution of disease at presentation. For example, in patients with known supraclavicular, infraclavicular, or internal mammary nodal disease, care should be taken to insure adequate coverage and dose to tumors that may not have been addressed surgically at standard mastectomy. This frequently requires modification of the “standard” radiation techniques used for earlier stage disease. For the chest wall, two common techniques include using only tangents to treat the entire chest wall and using tangents to treat lateral chest wall with matched electron field to treat the medial chest wall and internal mammary chain (IMC) nodes. In some selected patients, the entire chest wall may be treated with electron beam [91,92]. The supraclavicular fossa is typically treated with single photon field. The specified dose to the chest wall and undissected lymph nodes is at least 50 Gy, and many centers will boost the operative flaps an additional 10-16 Gy. There are limited data to suggest improved locoregional control with the higher doses [93,94]. Unresected lymph node involvement of the IMC, infraclavicular fossa, or supraclavicular fossa are also boosted an additional 10-16 Gy. Local recurrence rates after full axillary dissection is probably low, and specific targeting of the low axilla may be unnecessary [95].

Breast Reconstruction

For patients who undergo mastectomy, breast reconstruction with native tissue or with implants is commonly performed. When irradiated with standard postmastectomy techniques, myocutaneous flaps are thought to better tolerate the effects of radiation [96]. About 60% of patients eventually had cosmesis that was rated as excellent by the physicians. Unfortunately, immediate breast reconstruction probably has a negative impact on RT treatment planning, with compromises in target coverage (chest wall and draining lymphatic beds) due to the anatomic geometry of the reconstructed breast [97]. Only 4 of 18 plans achieved optimal coverage of the targets, including the chest wall and the draining nodal beds, while 12 plans had compromised coverage of chest wall breadth and nine plans did not cover the internal mammary chains. Therefore, since all patients with

advanced breast cancers require postmastectomy RT, reconstruction should be delayed until after the radiation to facilitate the treatment of the larger volumes at risk in this population.

Toxicity

Many common toxicities, such as radiation dermatitis, occur during the course of irradiation for locally advanced breast cancer. However, one major toxicity noted in the older studies was an increase in cardiovascular mortality in patients treated with postmastectomy RT. Analyzing data from the Surveillance, Epidemiology and End Results (SEER) database in early breast cancer patients, patients who were treated to the left breast had progressively increasing risk for ischemic mortality with longer time interval from the RT [98]. This was only significant for patients treated before 1982. No difference in 15-year mortality from ischemic events was seen between patients who received left breast versus right breast RT when the radiation was delivered after 1980 [99]. In large randomized trials such as the Danish Breast Cancer Cooperative Group Trial and the British Columbia trial, no significant difference was seen between left- and right-sided RT [47,49].

Summary

Patients with LABC have a high risk for both LRR and DM. Proper initial imaging of the breast and nodal beds is essential for both staging and RT planning. There are only a few randomized trials that specifically examined the role of radiation in LABC patients. Preferred techniques and clinical target volumes and the optimum doses to these regions have not been prospectively studied for advanced breast cancer. However, trimodality therapy with chemotherapy, surgery, and radiation seems to accomplish the best outcome. In fact, breast conservation can be achieved in a select population of patients who have a good response to neoadjuvant chemotherapy.

Supporting Document(s)

- [ACR Appropriateness Criteria® Overview](#)
- Evidence table under review

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The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.