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Medical Policy Manual Medicine, Policy No. 166

Intensity Modulated Radiotherapy (IMRT) for Breast Cancer

Effective: December 1, 2020

Next Review: September 2021
Last Review: October 2020

IMPORTANT REMINDER

Medical Policies are developed to provide guidance for members and providers regarding coverage in accordance with contract terms. Benefit determinations are based in all cases on the applicable contract language. To the extent there may be any conflict between the Medical Policy and contract language, the contract language takes precedence.

PLEASE NOTE: Contracts exclude from coverage, among other things, services or procedures that are considered investigational or cosmetic. Providers may bill members for services or procedures that are considered investigational or cosmetic. Providers are encouraged to inform members before rendering such services that the members are likely to be financially responsible for the cost of these services.

DESCRIPTION

Intensity modulated radiotherapy (IMRT) is a form of radiation therapy that conforms closely to the targeted tumor shape and allows higher doses of radiation to be delivered while minimizing toxicity to surrounding healthy tissues.

MEDICAL POLICY CRITERIA

I. Intensity modulated radiotherapy (IMRT) may be considered **medically necessary** for breast cancer treatment (either definitive post lumpectomy or adjuvant post mastectomy) when any of the following criteria are met (NOTE: *This policy addresses specific indications only. Please see Medicine, Policy No. 167 for requests where only through IMRT can published dose/volume constraints be met for organs at risk*):

   A. When there is documented prior radiation treatment to the planned target volume; or

   B. When documentation demonstrates need for IMRT to minimize focal hot spot(s) within the breast tissue from greater than 10% to less than 10% of the prescribed dose; or

C. When documentation demonstrates that IMRT planning can achieve a 10% or greater reduction in mean dose to the heart, left ventricle, left main coronary, or left anterior descending artery.

II. Intensity-modulated radiotherapy (IMRT) is considered **not medically necessary** for the treatment of breast cancer not meeting the criteria above (NOTE: *Please use Policy No. 167 for requests where only through IMRT can published dose/volume constraints be met for organs at risk*).

NOTE: A summary of the supporting rationale for the policy criteria is at the end of the policy.

POLICY GUIDELINES

ORGANS AT RISK

Organs at risk are defined as normal tissues whose radiation sensitivity may significantly influence treatment planning and/or prescribed radiation dose.[1] These organs at risk may be particularly vulnerable to clinically important complications from radiation toxicity.

LIST OF INFORMATION NEEDED FOR REVIEW

REQUIRED DOCUMENTATION:

It is critical that the list of information below is submitted for review to determine if the policy criteria are met. If any of these items are not submitted, it could impact our review and decision outcome. Quality assurance for 3D and IMRT submitted plans are not required with a preauthorization request.

- Clinical history
- Physical/chart notes
- Relevant imaging reports documenting that the policy criteria are met for medical necessity.

CROSS REFERENCES

1. Charged-Particle (Proton) Radiotherapy, Medicine, Policy No. 49
2. Intensity Modulated Radiotherapy (IMRT) of the Central Nervous System (CNS), Head, Neck, and Thyroid, Medicine, Policy No. 164
3. Intensity Modulated Radiotherapy (IMRT) of the Thorax, Abdomen, Pelvis, and Extremities, Medicine, Policy No. 165
4. Intensity Modulated Radiotherapy (IMRT) for Tumors in Close Proximity to Organs at Risk, Medicine, Policy No. 167
5. Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy for Intracranial, Skull Base, and Orbital Sites, Surgery, Policy No. 213
6. Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy for Tumors Outside of Intracranial, Skull Base, or Orbital Sites, Surgery, Policy No. 214

BACKGROUND

RADIATION TECHNIQUES

Conventional External Beam Radiotherapy

Over the past several decades, methods to plan and deliver RT have evolved in ways that permit more precise targeting of tumors with complex geometries. Most early trials used two-dimensional radiation therapy (2D-RT) treatment planning, based on flat images and radiation beams with cross-sections of uniform intensity that were sequentially aimed at the tumor along two or three intersecting axes. Collectively, these methods are termed conventional external beam radiation therapy (EBRT).

Three-Dimensional Conformal Radiation

Treatment planning evolved by using three dimensional images, usually from computed tomography (CT) scans, to delineate the boundaries of the tumor and discriminate tumor tissue from adjacent normal tissue and nearby organs at risk for radiation damage. Computer algorithms were developed to estimate cumulative radiation dose delivered to each volume of interest by summing the contribution from each shaped beam. Methods also were developed to position the patient and the radiation portal reproducibly for each fraction and immobilize the patient, thus maintaining consistent beam axes across treatment sessions. Collectively, these methods are termed three-dimensional conformal radiation therapy (3D-CRT).

Intensity-Modulated Radiotherapy

IMRT, which uses computer software, CT images, and magnetic resonance imaging (MRI), offers better conformality than 3D-CRT, as it is able to modulate the intensity of the overlapping radiation beams projected on the target and to use multiple-shaped treatment fields. It uses a device (a multileaf collimator [MLC]) which, coupled to a computer algorithm, allows for “inverse” treatment planning. The radiation oncologist delineates the target on each slice of a CT scan and specifies the target’s prescribed radiation dose, acceptable limits of dose heterogeneity within the target volume, adjacent normal tissue volumes to avoid, and acceptable dose limits within the adjoining organs at risk (OAR). Based on these parameters and a digitally reconstructed radiographic image of the tumor and surrounding tissues and organs at risk, computer software optimizes the location, shape, and intensities of the beams ports, to achieve the treatment plan’s goals.

Increased conformality may permit escalated tumor doses without increasing normal tissue toxicity and thus may improve local tumor control, with decreased exposure to surrounding normal tissues, potentially reducing acute and late radiation toxicities. Better dose homogeneity within the target may also improve local tumor control by avoiding underdosing within the tumor and may decrease toxicity by avoiding overdosing. Alternatively, IMRT provides the opportunity to construct heterogenous dose deposition within the target volume thus tailoring differential dose in keeping with physician assessment of differential cancer cell density, etc. This may diminish local failure within the overall target volume.

Because most tumors move as patients breathe, dosimetry with stationary targets may not accurately reflect doses delivered within target volumes and adjacent tissues in patients. Furthermore, treatment planning and delivery are more complex, time-consuming, and labor-intensive for IMRT than for 3D-CRT. Thus, clinical studies must test whether IMRT improves tumor control or reduces acute and late toxicities when compared with 3D-CRT.

WHOLE AND PARTIAL BREAST IRRADIATION

Definitive or adjunctive irradiation to the breast may initially include the entire breast with or without subsequent “boost” to the lumpectomy cavity or be targeted solely to the lumpectomy

cavity plus small safety margin (i.e. partial breast irradiation). Both formats of breast irradiation may be provided via a mixture of external irradiation techniques (i.e. teletherapy and/or insertion of needles or balloon like devices containing radioactive substances and implanted in the breast tissue), thus providing irradiation therapy from within the targeted tissues (i.e. brachytherapy). Whole breast irradiation is typically scheduled once a day for three to seven weeks while partial breast treatment is commonly delivered twice a day for five days.

EVIDENCE SUMMARY

Multiple-dose planning studies generate three-dimensional conformal radiation (3D-CRT) and intensity-modulated radiotherapy (IMRT) treatment plans from the same scans, and then compare predicted dose distributions within the target area and adjacent organs. Results of such planning studies have shown that IMRT is better than 3D-CRT with respect to conformality to, and dose homogeneity within, the target. Results have also demonstrated that IRMT less radiation to nontarget areas. Dosimetry studies using stationary targets generally confirm these predictions. However, because patients move during treatment, dosimetry with stationary targets only approximate actual radiation doses received. Based on these dosimetry studies, radiation oncologists expect IMRT to improve treatment outcomes compared with those of 3D-CRT.

Comparative studies of radiation-induced adverse effects from IMRT versus alternative radiation delivery would constitute definitive evidence in establishing the benefit of IMRT. Single-arm series of IMRT can give some insights into the potential for benefit, particularly if an adverse effect that is expected to occur at high rates is shown to decrease by a large amount. Studies of treatment benefit are also important to establish that IMRT is at least as good as other types of delivery, but, absent such comparative trials, it is likely that benefit from IMRT is at least as good as with other types of delivery.

In general, when the indication for IMRT is to avoid radiation to sensitive areas, dosimetry studies have been considered sufficient evidence to demonstrate that harm would be avoided by using IMRT.[1] For other IMRT indications, such as using IMRT to provide better tumor control, comparative studies of health outcomes are needed to demonstrate such a benefit.

BREAST CANCER

The grading of acute radiation dermatitis is relevant to studies of IMRT for treatment of breast cancer. Acute radiation dermatitis is graded on a scale of zero (no change) to five (death). Grade two is moderate erythema and patchy moist desquamation, mostly in skin folds; grade three is moist desquamation in other locations and bleeding with minor trauma. Publications have also reported on the potential for IMRT to reduce radiation to the heart (left ventricle) in patients with left-sided breast cancer and unfavorable cardiac anatomy.[2] This is a concern because of the potential development of late cardiac complications (e.g., coronary artery disease) following RT to the left breast.

Whole-Breast Irradiation

Systematic Reviews

In 2012, Dayes published a systematic review that examined the evidence for IMRT for whole-breast irradiation in the treatment of breast cancer to quantify its potential benefits and to make recommendations for radiation treatment programs.[3] Based on a review of six published

reports through March 2009 (one randomized controlled trial [RCT], three retrospective cohort studies, one historically controlled trial, one prospective cohort) including 2012 patients, the authors recommended IMRT over tangential RT after breast-conserving surgery to avoid acute adverse effects associated with radiation. There was insufficient data to recommend IMRT over standard tangential RT for reasons of oncologic outcomes or late toxicity. In the RCT included in this review, the Canadian multicenter trial by Pignol (2008) reported next, IMRT was compared with 2D-RT. CT scans were used in treatment planning for both arms of the study. The types of conventional RT regimens were not reported for the other studies.

Two of the six cohort studies reviewed by Dayes reported on breast cancer-related outcomes.[3] Neither of these studies reported statistically significant differences between treatment groups for contralateral breast cancer rates, clinical recurrence-free survival or disease-specific survival. Despite differences in reported outcomes, all six studies reported reductions in at least one measure of acute toxicity as a result of IMRT-based breast radiation. These toxicities typically related to skin reactions during the course of treatment, with reductions being in the order of one third. The RCT by Pignol (summarized below), for example, found a reduction in moist desquamation specific to the inframammary fold by 39%. Only two retrospective cohort studies reported on late toxicity effects; one cohort study reported a significant difference between IMRT and tangential RT in favor of IMRT for breast edema (IMRT, 1% vs 25%, $p<0.001$), and the other study found a trend toward a reduction in lymphedema rates ($p=0.06$). No differences were observed across both studies in other late effects including fat necrosis or second malignancies.[3]

Randomized Controlled Trials

In their RCT, Jagsi (2018) assessed whether IMRT with deep inspiration breath hold (DIBH) reduces cardiac or pulmonary toxicity of breast RT compared to 3D-CRT, the current standard RT.[4] The study included 62 women with node-positive breast cancer in whom RT was indicated for treating the left breast or chest-wall and the internal mammary, infraclavicular and supraclavicular nodal regions. The primary outcome was the percentage decrease in heart perfusion at one-year post-treatment compared to baseline, measured using attenuation corrected single-photon emission computed tomography. A secondary outcome was a change in left ventricular ejection fraction. The 3D-CRT group received ≥5 Gy to 15.8% of the left ventricle; the IMRT-DIBH group received 5.6% to the left ventricle ($P < 0.001$). At one year, no differences in perfusion of the heart were detected; however, significant differences were found in left ventricular ejection fraction. In the 3D-CRT arm, six patients had >5% changes in left ventricular ejection fraction, and the IMRT-DIBH arm had one patient with >5% change. The authors contend that their study is important because it demonstrates that the IMRT-DIBH technique’s reduction in cardiac dose could be associated with better preservation of cardiac left ventricle function—a potentially clinically meaningful finding. One limitation of this study is its small size, and only one follow-up scan was conducted at one year due to resource constraints. A six-month scan might have shown greater differences between the two arms.

The 2008 multicenter, double-blind RCT by Pignol (2008) evaluated whether breast IMRT would reduce the rate of acute skin reaction (moist desquamation), decrease pain, and improve quality of life (QOL) compared with RT using wedges.[5 6] Patients were assessed each week up to six weeks after RT and then at eight and ten years. A total of 358 patients were randomly assigned between July 2003 and March 2005 in two Canadian centers, and 331 were included in the analysis. The authors noted that breast IMRT significantly improved the dose distribution compared with 2D-RT. They also noted a lower proportion of patients with

moist desquamation during or up to six weeks after radiation treatment (31% with IMRT vs 48% with standard treatment; p=0.002). A multivariate analysis found the use of breast IMRT and smaller breast size were significantly associated with a decreased risk of moist desquamation. The presence of moist desquamation significantly correlated with pain and a reduced QOL. At a median follow-up of 9.8 years, there was no significant difference in chronic pain between treatment arms. Young age (p=0.013) and pain during RT (p<0.001) were associated with chronic pain. Poorer self-assessed cosmetic outcome (p<0.001) and QOL (p<0.001) were also associated with pain during RT.

Donovan (2002) reported on an RCT comparing outcomes with conventional 2D-RT with wedged, tangential beams or IMRT in 300 breast cancer patients.[7] In an abstract, investigators reported interim cosmetic outcomes at two years postrandomization for 233 evaluable patients. In 2007, Donovan published a subsequent report on this trial.[8] Enrolled patients had “higher than average risk of late radiotherapy-adverse effects,” which included patients having larger breasts. The authors stated that while breast size is not particularly good at identifying women with dose inhomogeneity falling outside current International Commission on Radiation Units and Measurements guidelines, their trial excluded women with small breasts (≤500 cm3), who generally have fairly good dosimetry with standard 2D compensators. All patients were treated with six or 10 megavolt photons to a dose of 50 gray (Gy) in 25 fractions in five weeks followed by an electron boost to the tumor bed of 11.1 Gy in five fractions. The primary end point was change in breast appearance scored from serial photographs taken before RT and at one-, two-, and five-year follow-ups. Secondary end points included patient self-assessments of breast discomfort, breast hardness, QOL, and physician assessments of breast induration. Two hundred forty (79%) patients with five-year photographs were available for analysis. Change in breast appearance was identified in 71 (58%) of 122 allocated standard 2D treatment compared with 47 (40%) of 118 patients allocated IMRT. Significantly fewer patients in the IMRT group developed palpable induration assessed clinically in the center of the breast, pectoral fold, inframammary fold, and at the boost site. No significant differences between treatment groups were found in patient-reported breast discomfort, breast hardness, or quality of life. The authors concluded that minimization of unwanted radiation dose inhomogeneity in the breast reduced late adverse effects. While the change in breast appearance was statistically different, a beneficial effect on QOL was not demonstrated

In 2009, Barnett published baseline characteristics and dosimetry results of a single-center RCT of IMRT for early breast cancer after breast-conserving surgery.[9] Subsequently, in 2012, Barnett reported on the two-year interim results of the RCT.[10] In this trial, 1145 patients with early breast cancer were evaluated for external-beam radiotherapy. Twenty-nine percent had adequate dosimetry with standard RT. The other 815 patients were randomly assigned to receive either IMRT or 2D-RT. Inhomogeneity occurred most often when the dose-volume was greater than 107% (V107) of the prescribed dose to greater than 2 cm3 breast volume with conventional radiation techniques. When breast separation was 21 cm or more, 90% of patients had received greater than V107 of the prescribed dose to greater than 2 cm3 with standard radiation planning. The incidence of acute toxicity did not differ significantly between groups. Additionally, photographic assessment scores for breast shrinkage were not significantly different between groups. The authors noted overall cosmesis after 2D-RT and IMRT was dependent on surgical cosmesis, suggesting breast shrinkage and induration were due to surgery rather than radiation, thereby masking the potential cosmetic benefits of IMRT.

Nonrandomized Comparative Studies

Guttmann (2018) published a single-center retrospective analysis of 413 women who received tangential whole-breast irradiation between 2011 and 2015.[11] Of the patients, 212 underwent IMRT and 201 received 3D-CRT. The main end point was a comparison of acute radiation dermatitis (grade 2+), and secondary end points were acute fatigue and breast pain. Grade 2+ radiation dermatitis was experience by 59% of 3D-CRT patients and 62% of IMRT (p=0.09). There was also no significant difference between 3D-CRT and IMRT for breast pain (grade 2+, 18% vs 18%, respectively; p=0.33) or fatigue (grade 2+, 18% vs 25.5%, respectively; p=0.24). A study limitation was that follow-up varied across patients because those treated with IMRT completed treatment one week sooner that those treated with 3D-CRT.

In 2012, Hardee compared the dosimetric and toxicity outcomes after treatment with IMRT or 3D-CRT for WBI in 97 consecutive patients with early-stage breast cancer, who were assigned to either approach after partial mastectomy based on insurance carrier approval for reimbursement for IMRT.[12] IMRT significantly reduced the maximum radiation dose to the breast (Dmax median, 110% for 3D-CRT vs 107% for IMRT; p<0.001) and improved median dose homogeneity (median, 1.15 for 3D-CRT vs 1.05 for IMRT; p<0.001) when compared with 3D-CRT. These dosimetric improvements were seen across all breast volume groups. Grade two dermatitis occurred in 13% of patients in the 3D-CRT group and 2% in the IMRT group. IMRT moderately decreased rates of acute pruritus (p=0.03) and grade two and three subacute hyperpigmentation (p=0.01). With a minimum of six months of follow-up, the treatment was reported to be similarly well-tolerated by both groups, including among women with large breast volumes.[12]

Freedman studied the time spent with radiation-induced dermatitis during a course of RT for women with breast cancer treated with 2D-RT or IMRT.[13] For this 2009 study, the population consisted of 804 consecutive women with early-stage breast cancer treated with breast-conserving surgery and radiation from 2001 to 2006 at a single center. All patients were treated with whole-breast radiotherapy (WBRT) followed by a boost to the tumor bed. WBRT consisted of conventional wedged photon tangents (n=405) earlier in the study period, and mostly of photon IMRT (n=399) in later years. All patients had acute dermatitis graded weekly during treatment. The IMRT patients spent 82% of weeks during treatment with grade 0 or 1 dermatitis and 18% with grade two or three dermatitis, compared with 29% and 71% of patients, respectively, treated with 2D-RT (p<0.001). From this pre/post study, the authors concluded that breast IMRT is associated with a significant decrease both in the time spent during treatment with grade two or three dermatitis and in the maximum severity of dermatitis compared with that associated with conventional radiation. Interpretation of these results is limited by lack of a contemporaneous comparators.

Hardee (2012) compared the dosimetric and toxicity outcomes after treatment with IMRT or 3D-CRT for whole-breast irradiation in a consecutive series of 97 patients with early stage breast cancer, who were assigned to either approach after segmental mastectomy based on insurance carrier approval for reimbursement for IMRT.21 IMRT significantly reduced the maximum dose to the breast (Dmax median, 110% for 3D-CRT vs 107% for IMRT; Wilcoxon test, p<0.001) and improved median dose homogeneity (median, 1.15 for 3D-CRT vs 1.05 for IMRT; Wilcoxon test, p<0.001) when compared with 3D-CRT. These dosimetric improvements were seen across all breast volume groups. Grade two dermatitis occurred in 13% of patients in the 3D-CRT group and 2% in the IMRT group. IMRT moderately decreased rates of acute pruritus (p=0.03) and grade two to three subacute hyperpigmentation (Fisher exact test, p=0.01). With a minimum of six months of follow-up, the treatment was reported to be similarly well-tolerated in either group, including among women with large breast volumes.[12]

Partial Breast Irradiation

IMRT has also been investigated as a technique of partial breast irradiation, as an alternative to whole breast irradiation therapy after breast conserving surgery.

Randomized Controlled Trials

IMRT has also been investigated as a technique of partial-breast irradiation, as an alternative to 3D-WBRT after breast-conserving surgery. In 2010, Livi reported on preliminary results for 259 patients randomized in a phase three trial, which began in September 2008, that compared conventional fractionated WBI treatment (n=128) to accelerated partial-breast irradiation (APBI) with IMRT (n=131).[14] Radiation Therapy Oncology Group grade one and two skin toxicity were observed at rates of 22% and 19% in the whole-breast treatment group versus 5% and 0.8% in the partial-breast treatment group, respectively. The authors concluded partial-breast irradiation with IMRT is feasible but noted long-term results on health outcomes are needed. Additionally, 18 months after RT, one case of contralateral breast cancer was diagnosed in the partial-breast irradiation group, raising authors' concern that it may be related to the high dosage of IMRT.

Five-year survival analysis results of the Livi RCT were reported in 2015.[15] A total of 520 patients were accrued, with 260 per group. The WBI arm received conventional RT at total dose of 50 Gy in 25 fractions, followed by a boost to the tumor bed of 10 Gy in five fractions. The APBI arm received a total dose of 30 Gy to the tumor bed in five daily fractions. The primary end point was occurrence of Ipsilateral breast tumor recurrence, with main analysis by intention-to-treat. At median follow-up of five years for all patients (interquartile range, 3.4 to 7.0), the Ipsilateral breast tumor recurrence rate was 1.5% (three cases; 95% CI, 0.1 to 3.0) in the APBI group and 1.5% in the WBI group (three cases; 95% CI 0.0 to 2.8). Log-rank analysis showed no significant difference between the groups (p=0.86). The five-year OS rate was 99% for the APBI group and 97% for the WBI group (p=*NS*). The APBI group had significantly better acute (p≤0.000) and late (p=0.004) skin adverse events (grade ≤2) compared with the WBI group and better cosmetic outcome (p=0.045).

Ten-year results of the Livi RCT were reported in 2020. Median follow-up was 10.7 years. Similar outcomes between groups were reported for 10-year cumulative incidence of ipsilateral breast tumor recurrence (WBI: 2.5%; APBI: 3.7%; p=0.40), 10-year OS (91.9% in both group; p=0.86), and 10-year breast cancer-specific survival (WBI: 96.7%; APBI: 97.8%; p=0.45). There were statistically significant differences reported for acute toxicity, late toxicity, and cosmetic outcome (all p=0.0001), with better outcomes reported in the APBI arm.

Chest Wall Irradiation

Few studies have examined the use of IMRT for chest wall irradiation in postmastectomy breast cancer patients. Available studies have mainly focused on treatment planning and techniques to improve dose distributions to targeted tissues while reducing radiation to normal tissue and critical surrounding structures, such as the heart and lungs.

Ho (2019) published the long-term pulmonary outcomes of a feasibility study of inverse-planned, multibeam intensity modulated radiation therapy in node-positive breast cancer patients receiving regional nodal irradiation.[16] Authors determined that based on early treatment planning criteria, multibeam IMRT in this population was dosimetrically feasible. While the authors' primary endpoint was feasibility, they also observed the incidence of

radiation pneumonitis grade 3 or greater and changes in pulmonary function. The later endpoints were measured with the Common Terminology Criteria for Adverse Events and pulmonary function tests and community-acquired pneumonia questions. Of 104 completed follow-up procedures, the overall rate of respiratory toxicity was 10.6%, with 1 grade 3 radiation pneumonitis event.

Rastogi (2018) published a retrospective study of 107 patients receiving radiotherapy post mastectomy to the left chest wall.[17] Patients were treated with 3D-CRT (n=64) or IMRT (n=43). The planning target volume, homogeneity index, and conformity index for both groups were compared. IMRT had a significantly improved conformity index score (1.127) compared with 3D-CRT (1.254; p<0.001), while results for both planning target volume (IMRT, 611.7 vs 3D-CRT, 612.2; p=0.55) and homogeneity index (IMRT, 0.094 vs 3D-CRT, 0.096; p=0.83) were comparable. Furthermore, secondary analyses showed that IMRT differed had significantly lower mean- and high-dose volumes to the heart and ipsilateral lung (p<0.001 and p<0.001, respectively), while 3D-CRT had superior low-dose volume (p<0.001). The study was limited by its small population size and short follow-up.

Wang (2017) reported a retrospective study of postmastectomy IMRT.[18] A total of 200 patients were evaluated for performance and complications. Follow-up was a minimum of one year and mean of 28.5 months. Toxicities reported were three patients with grade 3 acute radiation dermatitis, one patient with grade 2 acute radiation-induced lung injury, three patients with acute radiation esophagitis, and seven patients with edema. A subset of 125 patients were followed for two or more years. Two-year local-regional recurrent, distant metastasis, and disease-free survival were 1.6%, 6.4%, and 92.8%, respectively.

Rudat (2011) compared IMRT treatment planning for chest wall irradiation with 3D-CRT in 20 postmastectomy patients.[19] The authors reported that IMRT resulted in significantly decreased heart and lung high dose-volume with a significantly improved conformity index when compared with 3D-CRT. However, there was no significant difference reported in the homogeneity index. The authors noted that longer-term prospective studies are needed to further assess cardiac toxicity and secondary lung cancer risk with multifield IMRT, which while reducing high dose-volume, increases mean heart and lung dose.

Summary

There is modest evidence from RCTs for a decrease in acute skin toxicity with IMRT compared with 2D-RT for WBI. One RCT reported improvements in moist desquamation of skin, but did not find differences in grade three or four skin toxicity, pain symptoms, or QOL. Another RCT found a change in breast appearance, but not QOL. A third RCT reported no differences in cosmetic outcomes at two years for IMRT compared with 2D-RT. Dosimetry studies have demonstrated that IMRT reduces inhomogeneity of radiation dose, thus potentially providing a mechanism for reduced skin toxicity. However, because WBRT is now delivered by 3D-CRT, these comparison data are of limited value. Studies on IMRT compared to 3D-CRT include one RCT on partial-breast IMRT and one nonrandomized comparative study on whole-breast IMRT. These studies have suggested that IMRT may improve short-term clinical outcomes. Ten-year follow-up is needed to evaluate the effect of partial-breast IMRT on recurrence and survival. Few studies have reported on health outcomes after IMRT for chest wall irradiation in postmastectomy breast cancer patients. The risk of secondary lung cancers and cardiac toxicity needs to be further evaluated.

PRACTICE GUIDELINE SUMMARY

NATIONAL COMPREHENSIVE CANCER NETWORK

National Comprehensive Cancer Network (NCCN) guidelines for breast cancer (v.6.2020) indicate that for whole-breast irradiation, uniform dose distribution and minimization of toxicity to normal tissue are the objectives and list various approaches to achieve this, including IMRT.[20] The guidelines state that “Greater target dose homogeneity and sparing of normal tissues can be accomplished using compensators such as wedges, forward planning using segments, and intensity-modulated radiation therapy (IMRT).”

AMERICAN SOCIETY FOR RADIATION ONCOLOGY

The American Society for Radiation Oncology (ASTRO) task force’s 2011 consensus-based guideline recommended that radiation doses to the lung and heart during whole breast irradiation should be minimized, provided the coverage of the breast is not compromised. IMRT was included in the ASTRO summary of techniques for WBRT following breast conserving therapy (BCT) or mastectomy, irrespective of margin width. There was no reference to IMRT in the 2018 updated guideline, but the guideline recommended a "preferred" radiation dosage of "4000 cGy [centigray] in 15 fractions or 4250 cGy in 16 fractions".[21]

SUMMARY

The available research on intensity modulated radiotherapy (IMRT) for breast cancer suggests that IMRT may lead to clinical outcomes comparable with 3D-conformal radiation therapy (CRT). In addition, IMRT may reduce cardiac doses in left-sided breast cancer, avoid or minimize hotspots to the breast, and lead to a decrease in acute skin toxicity. Therefore, IMRT to deliver breast irradiation may be considered medically necessary in select patients when policy criteria are met.

For situations where policy criteria are not met, intensity-modulated radiotherapy (IMRT) has not been shown to improve net health outcomes compared to other treatment modalities. Therefore, except in the select group of patients identified in the policy criteria, IMRT is not medically necessary for the treatment of breast cancer.

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CODES

NOTE: The correct code to use for image fusion performed to provide enhanced delineation of target and normal critical structures is CPT code 77399 (Unlisted procedure, medical radiation physics, dosimetry and treatment devices, and special services); however, it is considered part of the treatment planning.

Codes	Number	Description
CPT	77301	Intensity modulated radiotherapy plan, including dose volume histograms for target and critical structure partial tolerance specification
	77338	Multi-leaf collimator (MLC) device(s) for intensity modulated radiation therapy (IMRT), design and construction per IMRT plan (new code 1/1/10)
	77385	Intensity modulated radiation treatment deliver (IMRT), includes guidance and tracking, when performed; simple
	77386	;complex
HCPCS	G6015	Intensity modulated treatment delivery, single or multiple fields/arcs, via narrow spatially and temporally modulated beams, binary, dynamic mlc, per treatment session
	G6016	Compensator-based beam modulation treatment delivery of inverse planned treatment using 3 or more high resolution (milled or cast) compensator, convergent beam modulated fields, per treatment session

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