

Intensity Modulated Radiotherapy (IMRT) for Head and Neck Cancers and Thyroid Cancer

Effective: October 1, 2018

Next Review: August 2019

Last Review: September 2018

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

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 the treatment of head and neck cancers when one or more of the following criteria are met:
 - A. Primary and recurrent cancers (excluding skin cancer) arising from the oral cavity and lip, larynx, hypopharynx, oropharynx, nasopharynx, paranasal sinuses and nasal cavity, salivary glands, and soft tissue sarcomas, unusual histologies or occult primaries in the head and neck region; or
 - B. For any cancer in the head and neck region where there is documented prior radiation treatment to the planned target volume; or
 - C. For any tumor in the head and neck region, including but not limited to skin cancers and cervical vertebral tumors, in close proximity to organs at risk, when

comparative 3D versus IMRT dose/volume histograms are submitted AND the summary analysis (table preferred; with preauthorization request) is completed demonstrating that only through IMRT can published dose/volume constraints be met for organs at risk (quality assurance procedures are not required for preauthorization).

Example table ([Click here for a template to use](#)):

Summary Analysis of 3D vs IMRT Planning				
Organ(s) At Risk	Quantec Constraint	3D	IMRT	Can constraint <i>only</i> be met with IMRT?
Example: parotid glands (both)	Mean < 25 Gy	32 Gy	21 Gy	Yes
Example: parotid glands (both)	Mean <25 Gy	32 Gy	28 Gy	No
Example: parotid glands (both)	Mean <25 Gy	24 Gy	21 Gy	No

II. Intensity modulated radiotherapy (IMRT) may be considered **medically necessary** for treatment of thyroid cancer when any of the following criteria are met:

- A. Locoregional recurrence of thyroid carcinoma; or
- B. Anaplastic thyroid carcinoma; or
- C. Documented prior radiation treatment to the planned target volume; or
- D. For tumors in close proximity to organs at risk, when comparative 3D versus IMRT dose/volume histograms are submitted AND the summary analysis (table preferred; with preauthorization request) is completed demonstrating that only through IMRT can published dose/volume constraints be met for organs at risk (quality assurance procedures are not required for preauthorization).

Example table ([Click here for a template to use](#)):

Summary Analysis of 3D vs IMRT Planning				
Organ(s) At Risk	Quantec Constraint	3D	IMRT	Can constraint <i>only</i> be met with IMRT?
Example: parotid glands (both)	Mean < 25 Gy	32 Gy	21 Gy	Yes
Example: parotid glands (both)	Mean <25 Gy	32 Gy	28 Gy	No
Example: parotid glands (both)	Mean <25 Gy	24 Gy	21 Gy	No

III. Intensity-modulated radiotherapy (IMRT) is considered **not medically necessary** for the treatment of head, neck, and thyroid cancers not meeting Criterion I or II above.

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

POLICY GUIDELINES

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.

HEAD AND NECK CANCERS

- Clinical history, physical/chart notes, and relevant imaging reports documenting that the policy criteria are met for medical necessity.
- Submission of comparative 3D versus IMRT dose/volume histograms are not required with initial requests for head and neck cancers, but may be requested for specific cases. If dose/volume histograms are submitted, they must be accompanied by submission of a summary analysis detailed in Criterion I.C. documenting the need for IMRT. The best way to ensure criteria are met is to submit the provided summary analysis table.

THYROID CANCER

- Locoregional recurrence of thyroid carcinoma, anaplastic thyroid carcinoma, or prior radiation treatment to the planned target volume
 - Clinical history, physical/chart notes, and relevant imaging reports documenting that the policy criteria are met for medical necessity.
- Any other thyroid cancer
 - History and physical/chart notes documenting that the policy criteria are met for medical necessity
 - For tumors close to organ(s) at risk:
 - Clinical history, physical/chart notes, and relevant imaging reports documenting that the policy criteria are met for medical necessity.
 - The provider must submit 3D versus IMRT comparative dose/volume histograms and summary analysis as detailed in Criterion II.D. above. The best way to ensure criteria are met is to submit the provided summary analysis table. If using the table, please ensure all components are completed prior to submission. If any of these items are not provided it could impact our review and decision outcome.

ORGANS AT RISK

Organs at risk are defined as normal tissues whose radiation sensitivity may significantly influence treatment planning and/or prescribed radiation dose. These organs at risk may be particularly vulnerable to clinically important complications from radiation toxicity. Organs may include but are not limited to the following: oral cavity, mandible, cochlea, esophagus, salivary glands, brainstem, pharyngeal musculature, larynx, lens, temporal lobe, retina, optic nerve, optic chiasm, and spinal cord.

CROSS REFERENCES

1. [Charged-Particle \(Proton\) Radiotherapy](#), Medicine, Policy No. 49
2. [Intensity Modulated Radiotherapy \(IMRT\) of the Thorax](#), Medicine, Policy No. 136
3. [Intensity Modulated Radiotherapy \(IMRT\) of the Prostate](#), Medicine, Policy No. 137
4. [Intensity-Modulated Radiotherapy \(IMRT\) of the Abdomen and Pelvis](#), Medicine, Policy No. 139
5. [Intensity-Modulated Radiotherapy \(IMRT\) for Central Nervous System \(CNS\) Tumors](#), Medicine, Policy No. 147
6. [Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy](#), Surgery, Policy No. 16

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 2D 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 radiotherapy (EBRT).

Three-Dimensional Conformal Radiation

Treatment planning evolved by using 3D 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 radiotherapy (3D-CRT).

Intensity-Modulated Radiotherapy

IMRT, which uses computer software and CT and MRI images, offers better conformality than 3D-CRT, as it is able to modulate the intensity of the overlapping radiation beams projected on the target and use multiple shaped treatment fields. It uses a device (a multileaf collimator) 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 normal tissues. 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 goals.

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.

Multiple-dose planning studies have generated 3D-CRT and IMRT treatment plans from the same scans, then compared predicted dose distributions within the target and in adjacent organs at risk. Results of such planning studies show that IMRT improves on 3D-CRT with respect to conformality to, and dose homogeneity within, the target. Dosimetry using stationary targets generally confirms these predictions. Thus, radiation oncologists hypothesized that IMRT may improve treatment outcomes compared with those of 3D-CRT. However, these types of studies offer indirect evidence on treatment benefit from IMRT, and it is difficult to relate results of dosing studies to actual effects on health outcomes.

Comparative studies of radiation-induced adverse effects from IMRT versus alternative radiation delivery are probably the most important type of evidence in establishing the benefit

of IMRT. Such studies would answer the question of whether the theoretical benefit of IMRT in sparing normal tissue translates into real health outcomes. 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 in the absence of such comparative trials, it is likely that benefit from IMRT is at least as good as with other types of delivery.

Head and Neck Tumors

Head and neck cancers account for approximately 3% to 5% of cancer cases in the United States. The generally accepted definition of head and neck cancers includes cancers arising from the oral cavity and lip, larynx, hypopharynx, oropharynx, nasopharynx, paranasal sinuses and nasal cavity, salivary glands, and occult primaries in the head and neck region. Cancers generally not considered as head and neck cancers include uveal and choroidal melanoma, cutaneous tumors of the head and neck, esophageal cancer, and tracheal cancer. Thyroid cancers are also addressed in this policy. EBRT is uncommonly used in the treatment of thyroid cancers but may be considered in patients with anaplastic thyroid cancer and for locoregional control in patients with incompletely resected high-risk or recurrent differentiated (papillary, follicular, or mixed papillary-follicular) thyroid cancer.

EVIDENCE SUMMARY

Intensity-modulated radiotherapy (IMRT) methods to plan and deliver radiotherapy (RT) are not uniform. IMRT may use beams that remain on as multileaf collimators (MLCs) that move around the patient (dynamic MLC) or that are off during movement and turn on once the MLC reaches prespecified positions (“step and shoot” technique). A third alternative uses a very narrow single beam that moves spirally around the patient (tomotherapy). Each of these methods uses different computer algorithms to plan treatment and yields somewhat different dose distributions in and outside the target. Patient position can alter target shape and thus affect treatment plans. Treatment plans are usually based on one imaging scan, a static three-dimensional (3D) computed tomography (CT) image. Current methods seek to reduce positional uncertainty for tumors and adjacent normal tissues by various techniques. Patient immobilization cradles and skin or bony markers are used to minimize day-to-day variability in patient positioning. In addition, many tumors have irregular edges that preclude drawing tight margins on CT scan slices when radiation oncologists contour the tumor volume. It is unknown whether omitting some tumor cells or including some normal cells in the resulting target affects outcomes of IMRT.

HEAD AND NECK CANCERS

Systematic Reviews and Technology Assessments

Ursino (2017) published a systematic review of 22 studies (total N=1311 patients) evaluating swallowing outcomes in patients treated with 3D-CRT or IMRT for head and neck cancer.^[1] The heterogeneity of the population limited analysis, but reviewers concluded that IMRT produced markedly better results than 3D-CRT in terms of swallowing impairments, aspiration, pharyngeal residue, and functional parameters, especially when swallowing-related organs at risk were specifically taken into account during IMRT treatment planning. The analysis was limited by a lack of standardized evaluation questionnaires, objective instrumental parameter scores, amount and consistency of bolus administration, and timing of evaluations.

In 2014, Marta reported on a systematic review and meta-analysis of five prospective Phase III randomized trials comparing IMRT to 2D-RT or 3D-CRT for head and neck cancer.^[2] A total of 871 patients were randomized in these five studies to IMRT (n=434) versus 2D-RT or 3D-CRT (n=437). Xerostomia grade 2-4 was found to be significantly lower in IMRT than 2D-RT and 3D-CRT for all studies (hazard ratio = 0.76; 95% confidence interval: 0.66, 0.87; p<0.001). Locoregional control and overall survival was similar between IMRT and 2D-RT or 3D-CRT.

A comparative effectiveness review was published in 2010 on radiotherapy treatment for head and neck cancers by Samson from the BlueCross BlueShield Association (BCBSA) Technology Evaluation Center under contract with the Agency for Healthcare Research and Quality (AHRQ).^[3] This report noted that based on moderate evidence, IMRT reduces late xerostomia and improves quality of life domains related to xerostomia compared with 3D-CRT. The report also noted that no conclusions on tumor control or survival could be drawn from the evidence comparing IMRT with 3D-CRT. An update of the BCBSA report published in 2014 was consistent with and strengthened the findings of the original review on late xerostomia.^[4]

Other systematic reviews have concluded similar findings as the previous systematic reviews for treatment of head and neck cancers.^[5-8]

Randomized Controlled Trials

Of the five phase three RCTs included in the meta-analysis by Marta, only one trial (Gupta, 2012) compared IMRT to 3D-CRT.^[9] In 2016, long-term results from this trial were published. This study included 60 patients with squamous cell carcinoma of the head and neck and was powered to detect a 35% difference in toxicity between the treatments (85% vs 50%). The proportion of patients with salivary gland toxicity was lower in the IMRT group (59%) compared to the 3D-CRT group (89%; p=0.009). The percentage of patients with substantial weight loss was significantly lower in the IMRT group at one and two years. There were no significant differences between the two groups for acute dysphagia, mucositis, dermatitis, or requirements for tube feeding. Xerostomia decreased over follow-up in both groups, but significant differences in late salivary toxicity persisted through five years. At two years after treatment, grade 2 or worse xerostomia was 0% in the IMRT group compared with 27.7% following 3D-CRT (p=0.017). At five years, salivary toxicity was 0% in the IMRT group compared with 16.7% following 3D-CRT (p=0.041). Locoregional control and overall survival were not significantly different between the two groups.

An RCT by Pow (2006) on IMRT for nasopharyngeal carcinoma (NPC) was published in 2006.^[10] However, as previously noted, this RCT compared IMRT with conventional 2D-RT. In 2011, Nutting (2011) reported on the PARSPORT randomized phase three trial, which also compared conventional RT with parotid-sparing IMRT in 94 patients with T1-4, N0-3, M0 pharyngeal squamous cell carcinoma.^[11] One year after treatment, grade 2 or worse xerostomia was reported in 38% of patients in the IMRT group, which was significantly lower than the reported 74% in the conventional RT group. Xerostomia continued to be significantly less prevalent two years after treatment in the IMRT group (29% vs 83%, respectively). At 24 months, rates of locoregional control, nonxerostomia late toxicities, and overall survival did not differ significantly.

The largest RCT on IMRT compared to 2D-RT was by Peng (2012).^[12] The trial included 616 patients with NPC. At a median follow-up of 42 months (range 1-83 months), patients in the IMRT group had significantly lower radiation-induced toxicities. The five-year overall survival rate was 79% in the IMRT group compared to 67.1% in the 2D-RT group.

Nonrandomized Studies

Choi (2018) described a single institution experience using IMRT to re-irradiate head and neck cancers.^[13] A total of 73 patients received re-irradiation to the recurrent gross tumor and tight margins. The median interval between initial radiotherapy and re-irradiation was 31 months. Locoregional recurrence after re-RT occurred in 37 patients, with a median survival of 33 months. Of evaluable patients, 14% reported clinically significant acute and 22% reported clinically significant late toxicities. The authors concluded that local control and survival were similar to historical data.

Also in 2018, Bišof assessed radiation modalities in 24 patients with carcinoma of the nasopharynx. Authors compared IMRT with simultaneous integrated boost (IMRT-SIB) parotid gland-sparing 3D-CRT (ConPas 3D-CRT).^[14] The IMRT-SIB group received significantly lower mean dose, dose to 50% parotid glands volume, and maximal dose to the spinal cord compared to the ConPas 3D-CRT group. The IMRT-SIB group also received superior coverage of planning target volumes. However, there were no significant differences between groups with respect to three-year OS (77% versus 81% for IMRT-SIB and ConPas 3D-CRT groups, respectively) or disease-free survival (51.9 and 70.7% for the IMRT-SIB and ConPas 3D-CRT groups, respectively).

Qiu (2017) published a retrospective, single-center study comparing 2D-conventional radiation therapy (2D-CRT) and IMRT as treatments for NPC in children and adolescents.^[15] All 176 patients (74 treated with 2D-CRT, 102 with IMRT) identified for the study were between 7 and 20 years old and treated at single institution. The OS rate at five years was significantly higher for IMRT than 2D-CRT (90.4% vs 76.1%, respectively; hazard ratio, 0.30; 95% confidence interval, 0.12 to 0.78; $p=0.007$), as well as the five-year disease-free survival rate (85.7% vs 71.2%, respectively; hazard ratio, 0.47; 95% confidence interval, 0.23 to 0.94; $p=0.029$). Grade 2, 3, and 4 xerostomia (52.7% vs 34%, respectively; $p=0.015$) and hearing loss (40.5% vs 22.5%, respectively; $p=0.01$) were also significantly lower with IMRT than with 2D-CRT. The duration of follow-up for late-onset radiation-induced toxicity and small sample size are limitations of the report.

A 2016 cross-sectional study by Huang included patients who had survived more than five years after treatment for NPC.^[16] Of 585 NPC survivors, data were collected on 242 patients who met study selection criteria (no history of tumor relapse or second primary cancers, cancer-free survival >5 years, completion of the self-reported questionnaire). Treatments were given from 1997 to 2007, with transition to the IMRT system in 2002. One hundred patients were treated with IMRT. Prior to the institution of IMRT, treatments included 2D-RT ($n=39$), 3D-CRT ($n=24$), and 2D-RT plus 3D-CRT boost ($n=79$). Patients had scheduled follow-ups at three- to four-month intervals until five-years posttreatment; then, at six-month intervals thereafter. Late toxicities (e.g., neuropathy, hearing loss, dysphagia, xerostomia, neck fibrosis) were routinely assessed at clinical visits. At the time of the study, the mean follow-up was 8.5 years after 2D-RT or 3D-CRT, and 6.4 years after IMRT. The IMRT group had statistically and clinically superior results for both clinician-assessed and patient-assessed (global quality of life, cognitive functioning, social functioning, fatigue, and 11 scales of the head and neck module) outcomes with moderate effect sizes after adjusting for covariates (Cohen's d range, 0.47-0.53). Late toxicities were less severe in the IMRT group, with adjusted odds ratios of 3.2, 4.8, 3.8, 4.1, and 5.3 for neuropathy, hearing loss, dysphagia, xerostomia, and neck fibrosis, respectively. No significant differences in late toxicities were observed between the 2D-RT and the 3D-CRT groups.

In 2009, Vergeer published a report that compared IMRT and 3D-CRT for patient-rated acute and late xerostomia, and health-related quality of life (HRQOL) among patients with head and neck squamous cell carcinoma (HNSCC).^[17] The study included 241 patients with HNSCC (cancers arising from the oral cavity, oropharynx, hypopharynx, nasopharynx, or larynx and those with neck node metastases from squamous cell cancer of unknown primary) treated with bilateral irradiation with or without chemotherapy. All patients were included in a program that prospectively assessed acute and late morbidity and HRQOL at regular intervals. Before October 2004, all patients were treated with 3D-CRT (n=150); starting in October 2004, 91 patients received IMRT. The use of IMRT resulted in a significant reduction of the mean dose to the parotid glands (27 gray [Gy] vs 43 Gy; $p < 0.001$). During radiation, grade 3 or higher xerostomia at six weeks was significantly less with IMRT (20%) than with 3D-CRT (45%). At six months, the prevalence of grade 2 or higher xerostomia was significantly lower after IMRT (32%) versus 3D-CRT (56%). Treatment with IMRT also had a positive effect on several general and head and neck cancer-specific HRQOL dimensions.

De Arruda (2006) reported on their experience treating 50 patients with oropharyngeal cancer (78% stage IV) with IMRT between 1998 and 2004.^[18] Eighty-six percent also received chemotherapy. The authors noted this represents the largest single-institution report for use of IMRT in this tumor. This study found two-year progression-free survival of 98% and regional progression-free survival of 88%, results similar to the 85% to 90% rates for locoregional control reported in other published studies. The rate for grade 2 xerostomia was 60% for acute and 33% for chronic (after nine months or more of follow-up); these rates are lower than the 60% to 75% generally reported with radiation therapy.

Hoppe (2008) reported on experience treating 37 patients with cancer of the paranasal sinuses, nasal cavity, and lacrimal glands with postoperative IMRT between 2000 and 2007.^[19] In this report with 28-month median follow-up, there was no early or late grade 3 or 4 radiation-induced ophthalmologic toxicity. Two-year local progression-free survival was 75%, and overall survival was 80%.

Braam (2006) reported on a phase II study that compared IMRT to conventional RT in oropharyngeal cancer.^[20] This study appeared to use 2D radiation therapy. The mean dose to the parotid glands was 48 Gy for RT and 34 Gy for IMRT. Both stimulated parotid flow rate and parotid complication (more than 25% decrease in flow rate) were greater in the RT group. At six months after treatment, 56% of IMRT patients and 81% of RT patients were found to have parotid complications.

Rusthoven (2008) compared outcomes with use of IMRT and -CRT in patients with oropharyngeal cancer.^[21] In this study, in which 32 patients were treated with IMRT and 23 with 3D-CRT, late xerostomia occurred in 15% of the IMRT patients and 94% of the 3D-CRT patients. There was also a trend toward improved locoregional control of the tumor with IMRT.

Hodge (2007) compared outcomes for patients with oropharyngeal cancer in the pre-IMRT era to those obtained in the IMRT era.^[22] In this study of 52 patients treated by IMRT, the late xerostomia rate was 56% in the IMRT patients, compared to 63% in those that did not receive IMRT. The authors noted that outcomes in these patients improved at their institution since the introduction of IMRT but that multiple factors may have contributed to this change. They also noted that even in the IMRT-era, the parotid-sparing benefit of IMRT cannot always be used; for example, in patients with bulky primary tumors and/or bilateral upper cervical disease.

Rades (2007) reported on 148 patients with oropharyngeal cancer treated with radiation therapy.^[23] In this study, late xerostomia was noted in 17% of those treated with IMRT compared with 73% of those who received 3D-CRT and 63% of those who received standard radiation therapy.

Additional publications of IMRT for head and neck cancers consist of a number of small case series and non-randomized comparisons that generally report favorable outcomes of this treatment.^[24-45]

THYROID CANCER

There are a small number of studies on use of IMRT for the treatment of thyroid cancer. In thyroid cancer, RT is generally used for two indications. The first indication is treatment of anaplastic thyroid cancer, and the second indication is potential use for locoregional control in patients with incompletely resected high-risk or recurrent differentiated (papillary, follicular, or mixed papillary-follicular) thyroid cancer. Anaplastic thyroid cancer occurs in a minority (<5%) of thyroid cancer.

The largest series comparing IMRT with 3D-CRT was published by Bhatia (2009)^[46] This study reviewed institutional outcomes for anaplastic thyroid cancer treated with 3D-CRT or IMRT for 53 consecutive patients. Thirty-one (58%) patients were irradiated with curative intent. Median radiation dose was 55 Gy (range, 4-70 Gy). Thirteen (25%) patients received IMRT to a median 60 Gy (range, 39.9-69.0 Gy). The Kaplan-Meier estimate of overall survival at one year for definitively irradiated patients was 29%. Patients without distant metastases receiving 50 Gy or higher had superior survival outcomes; in this series, use of IMRT versus 3D-CRT did not influence toxicity.

Schwartz (2009) reviewed institutional outcomes for patients treated for differentiated thyroid cancer with postoperative conformal EBRT.^[47] This was a single-institution retrospective review of 131 consecutive patients with differentiated thyroid cancer who underwent RT between January 1996 and December 2005. Histologic diagnoses included 104 papillary, 21 follicular, and six mixed papillary-follicular types. Thirty-four patients (26%) had high-risk histologic types and 76 (58%) had recurrent disease.

Extraglandular disease spread was seen in 126 patients (96%), microscopically positive surgical margins were seen in 62 patients (47%), and gross residual disease was seen in 15 patients (11%). Median RT dose was 60 Gy (range, 38-72 Gy). Fifty-seven patients (44%) were treated with IMRT to a median dose of 60 Gy (range, 56-66 Gy). Median follow-up was 38 months (range, 0-134 months). Kaplan-Meier estimates of locoregional relapse-free survival, disease-specific survival, and overall survival at four years were 79%, 76%, and 73%, respectively. On multivariate analysis, high-risk histologic features, M1 (metastatic) disease, and gross residual disease were predictors for inferior disease-specific and overall survival. IMRT did not impact survival outcomes but was associated with less frequent severe late morbidity (12% vs 2%, respectively), primarily esophageal stricture.

In 2011, Foote published a small case series (n=10) that reported the outcomes of the 10 anaplastic thyroid carcinoma (ACT) patients treated with an aggressive treatment combining IMRT, radiosensitizing, and adjuvant chemotherapy. The study found improved outcomes, including survival in stages IVA and IVB regionally confined ATC. Benefit in patients with stage IVC (metastatic) disease as well as the optimal chemotherapy regimen to use in conjunction with IMRT remains uncertain.^[48]

SUMMARY

In general, the evidence evaluating intensity-modulated radiotherapy (IMRT) for the treatment of head and neck cancer suggests that tumor control rates with IMRT are at minimum similar to those achieved with other non-IMRT techniques. In addition, although results are not uniform across all studies, most of the recent studies show a significant improvement in the rate of late xerostomia, a clinically significant complication of therapy that may result in decreased quality of life. Thus, published evidence shows an improvement in net health outcomes compared with non-IMRT methods.

Limited evidence exists on use of IMRT for thyroid cancer. The published literature consists of small case series with limitations. However, there is consensus that the use of IMRT for thyroid tumors may be appropriate in some circumstances such as for anaplastic thyroid carcinoma or for thyroid tumors that are located near critical structures (e.g., salivary glands, spinal cord). There is indirect evidence for the potential of IMRT to reduce harms. Therefore, IMRT may be considered for the treatment of thyroid cancers located in close proximity to organs at risk (esophagus, salivary glands, spinal cord) and three-dimensional conformal radiotherapy planning is not able to meet dose volume constraints for normal tissue tolerance.

PRACTICE GUIDELINE SUMMARY

NATIONAL COMPREHENSIVE CANCER NETWORK

The National Comprehensive Cancer Network (NCCN) guidelines (v.2.2018) on head and neck cancers comment that, that “IMRT has been shown to be useful in reducing long-term toxicity in oropharyngeal, paranasal sinus, and nasopharyngeal cancers by reducing the dose to salivary glands, temporal lobes, auditory structures (including cochlea), and optic structures.” The guidelines also indicate: “[t]he application of IMRT to other sites (e.g., oral cavity, larynx, hypopharynx, salivary glands) is evolving and may be used at the discretion of treating physician.

The NCCN guidelines on melanoma (v.3.2018) state “[n]ewer radiation modalities, such as IMRT or volumetric-modulated arc therapy (VMAT) may lower the risk of toxicity of adjuvant nodal radiation and should be considered when available and appropriate.”^[49]

For thyroid cancer, the NCCN guideline (v.1.2018) states that EBRT/IMRT may be considered for locoregional recurrence “For select patients with unresectable, non-radioiodine-avid, and progressive disease” and “structurally persistent/recurrent locoregional or distant metastatic disease not amenable to RAI therapy” that is iodine-refractory and unresectable or soft tissue metastases. Adjuvant EBRT/IMRT with or without chemotherapy is recommended for the treatment of anaplastic thyroid carcinoma.^[50]

AMERICAN COLLEGE OF RADIOLOGY AND AMERICAN SOCIETY FOR THERAPEUTIC RADIATION AND ONCOLOGY

The American College of Radiology and the American Society for Therapeutic Radiation and Oncology note that IMRT is a widely used treatment option for many indications including head and neck tumors. This guideline was last amended in 2014.^[51]

NATIONAL CANCER INSTITUTE

The National Cancer Institute (NCI) indicates IMRT may be appropriate for head and neck cancers in several instances.^[52,53] For nasopharyngeal cancer, NCI indicates IMRT results in a lower incidence of xerostomia and may provide a better quality of life than conventional 3D or 2D RT.^[54] IMRT may also be appropriate in select cases of recurrent nasopharyngeal cancer per NCI.^[54] Finally, to prevent or reduce the extent of salivary gland hypofunction and xerostomia, NCI indicates parotid-sparing IMRT is recommended as a standard approach in head and neck cancers, if oncologically feasible.^[55]

SUMMARY

The current research suggests that intensity-modulated radiotherapy (IMRT) provides tumor control rates comparable to existing radiotherapy techniques for head and neck cancers. In addition, research shows improvements in complications. Therefore, IMRT may be considered medically necessary for the treatment of head and neck cancers when criteria are met.

The current research on the use of intensity-modulated radiotherapy (IMRT) for the treatment of thyroid cancer is limited. However, IMRT may reduce the risk of exposure of radiation to critical nearby structures, such as the spinal cord, salivary glands, and esophagus. Therefore, IMRT may be considered medically necessary for the treatment of thyroid cancer when policy criteria are met.

For all other indications, the current evidence is insufficient to establish whether intensity-modulated radiotherapy (IMRT) improves net health outcomes compared to other radiation modalities. Therefore, except in the select group of patients identified in the policy criteria, IMRT is investigational for the treatment of all other head and neck and thyroid cancers.

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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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