

# Intensity Modulated Radiation Therapy for Thyroid Cancer: Is it Beneficial?

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Surgical resection with or without Radioactive Iodine therapy (RAI) is the typical management of differentiated thyroid cancer. The role of external beam radiation therapy is controversial. The National Comprehensive Cancer Network guidelines currently recommend Postoperative Radiation Therapy (PORT) for T4 disease with extrathyroidal extension and when the patient is greater than 45 years. Local failures occur in the thyroid bed, the surrounding the target volume and regional lymph nodes. The irregular shape of this target volume and the wide extent of lymph node stations at risk mean that delivering doses beyond 50 Gy by conventional methods of radiation techniques is difficult. Intensity-Modulated Radiation Therapy (IMRT) provides better dose coverage to the target volume [1,2].

Currently, the indications for radiation therapy in the management of thyroid cancer are controversial. The University of Florida (UF) indications [3] for PORT for differentiated thyroid cancer are in adults over 45 years of age with one of the following poor prognostic variables: positive margins, more than minimal extrathyroid extension (T4), multiple positive nodes with extracapsular extension and disease resistant to <sup>131</sup>I. Given the complexity of treating this target volume, IMRT offers an excellent method to deliver radiotherapy adequately. IMRT for the treatment of thyroid cancer has been compared to conventional techniques in two studies [1,4]. Nutting et al. [1] evaluated the potential role of IMRT in the treatment of thyroid cancer in 6 patients treated with EBRT. Conventional plans (3 fields: direct anterior and paired anterior-oblique wedge fields) were generated for each patient and compared with the 3D-CRT and IMRT plans. IMRT produced improved target coverage while reducing the volume of irradiated normal tissue ( $p = 0.01$ ) and maximum dose to the spinal cord ( $p = < 0.01$ ). Posner et al. [4] demonstrated similar results. All the treatment plans were able to deliver a minimum dose of 60 Gy to the 95% of the Gross Tumor Volume (GTV), while keeping the maximum spinal cord dose at or below 45 Gy. Rosenbluth et al. [5] and Urbano et al. [6] demonstrated locoregional control rates of 85% at 2 years. Urbano et al. [6] evaluated the toxicity results of a phase I study in the 13 patients treated with IMRT in locally advanced thyroid cancer. The mean PTV dose delivered to 95% of the volume was 56.4 Gy in 28 fractions (2.1 Gy per fraction, 5 fractions per week) and mean elective nodal dose was 46.4 Gy in 28 fractions (1.8 Gy per fraction). Grade 2 and

3 skin changes were seen in 31% and 38.5% patients and 53% while 8% developed grade 2 and 3 mucositis. No grade 4 toxicities were observed. Thirty percent of patients developed L'Hermitte's syndrome. All patients had complete response to treatment but 3 patients developed recurrence (one had local recurrence at 36 months, second in the mediastinum + lungs at 7 months and third bone and lung metastases 3 months later). Rosenbluth et al. [5] treated 20 nonanaplastic thyroid cancer patients with IMRT. Most of their patients had T4N1 disease. The doses of RT were 54 Gy for low-risk microscopic disease, 59.4-63 Gy to the high risk areas, 63-66 Gy for positive margins and 63-70 Gy to gross disease. Fourteen patients were treated with accelerated hyperfractionated RT, 1.6 Gy per fraction, twice daily. The 2-year local progression-free rate was 85%; with 2 local failures and the 2-year overall survival rate was 60%. Grade 3 acute mucositis and pharyngitis were seen in 7 and 3 patients respectively. Only 2 patients had symptomatic grade 3 acute skin toxicity and 2 had grade 3 acute laryngeal toxicity. No significant radiation-related late effects were reported. Thus, based on the evidence, IMRT offers excellent local control rates with minimal acute side effects in the treatment of differentiated thyroid cancer in the postoperative setting.

## References

1. Nutting CM, Convery DJ, Cosgrove VP, Rowbottom C, Vini L, et al. (2001) Improvements in target coverage and reduced spinal cord irradiation using intensity-modulated radiotherapy (IMRT) in patients with carcinoma of the thyroid gland. *Radiother Oncol* 60: 173-180.
2. Harmer C, Bidmead M, Shepherd S, Sharpe A, Vini L (1998) Radiotherapy planning techniques for thyroid cancer. *Br J Radiol* 71: 1069-1075.
3. Robert Amdur, William Mendenhall, Ernest Mazzaferri (2005) Indications for External Beam Radiation Therapy for Differentiated Thyroid Cancer. Springer 407-411.
4. Posner MD, Quivey JM, Akazawa PF, Xia P, Akazawa C, et al. (2000) Dose optimization for the treatment of anaplastic thyroid carcinoma: a comparison of treatment planning techniques. *Int J Radiat Oncol Biol Phys* 48: 475-483.
5. Rosenbluth BD, Serrano V, Happersett L, Shaha AR, Tuttle RM, et al. (2005) Intensity-modulated radiation therapy for the treatment of nonanaplastic thyroid cancer. *Int J Radiat Oncol Biol Phys* 63: 1419-1426.
6. Urbano TG, Clark CH, Hansen VN, Adams EJ, Miles EA, et al. (2007) Intensity Modulated Radiotherapy (IMRT) in locally advanced thyroid cancer: acute toxicity results of a phase I study. *Radiother Oncol* 85: 58-63.

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