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The Role of Re-irradiation for Recurrent Cancers of the Head and Neck

Epidemiology

The incidence of head and neck cancers worldwide is over half a million people. While heavily linked to tobacco and alcohol use, studies are associating these malignancies with viral infections such as Epstein Barr and Human Papilloma. Treatments usually entail a combination of surgery, chemotherapy, targeted therapy and/or radiation therapy. The success rate varies with site of disease, stage and histologic type of disease. Treatments also are usually associated with much toxicity.

Despite aggressiveness of treatment, there is a high rate of local and regional failures on the order of 15-30%. The second primary neoplasms of the head and neck occur roughly at the rate of 1% per year given the scenario field cancerization from tobacco, alcohol, or viral exposure.

Treatments

The options for treatment are limited in the situation of recurrent head and neck cancer after prior radiation (70% of all head and neck cancers receive radiation as part of their initial treatment) with or without chemotherapy and/or surgery. Many are offered supportive care only due to advanced disease or metastatic disease in someone who already has a poor performance status or health. Surgery is offered only in cases of small recurrences and usually requires adjuvant therapy also. Chemotherapy alone for recurrences yield NO chance for cure with on average a 30% response rate lasting an average of 6-8 months.

Re-irradiation with or without chemotherapy/targeted therapy is often the only curative option. Unfortunately, the cure rate is only in the 30% range, and the possible toxicities of such an approach can be prohibitive. These potential side effects include spinal cord damage, carotid artery rupture, stroke, osteoradionecrosis, fistula formation, optic pathway damage and central nervous system impairment from excess dose to the frontal and temporal lobes. In addition, because of possible morbidity of treatments, radiation doses required to eradicate the recurrent malignancy are not achievable given the possible radio-resistance of the underlying cancer cell population.

Re-irradiation with conventional radiation techniques led to high rates of acute and late toxicities in RTOG 9911. Further studies of Intensity modulated radiation therapy (IMRT) re-irradiation (higher conformality treatments) yielded a superior disease control and less dose to the normal tissue. Thus, an improved therapeutic index seemed to correlate with an improved conformality treatment. To further exploit the therapeutic ratio, Proton beam radiation therapy (PBRT) seem to be the best modality to explore further. PBRT possesses the highest form of conformality as it can be modulated to deliver higher doses to the tumor, while minimizing the dose to the previously irradiated normal tissues. The unique properties of PBRT can be explained by a comprehensive understanding of energy deposition upon entrance in the body. Protons enter with low energy deposition until a rapid increase in energy deposition is achieved within the “Bragg Peak”. This allows for both sparing of normal tissue, and intensified tumor doses. The capability of PBRT to maximize a focused dose of radiation to the tumor is complemented by the minimal exit dose delivered to surrounding non-target tissues.

Results

Thus, we paired our efforts at the Northwestern Medicine Chicago Proton Center with our colleagues at Memorial Sloan Kettering Cancer Center and the ProCure Proton Therapy Center in Somerset, NJ in study of 99 patients with recurrent or second malignant neoplasm of the head and neck after prior radiation therapy. The results are preliminary but very promising. With a median follow up of 7 months, there was an actuarial locoregional control rate and overall survival rate of 85% along with a freedom from distant metastases rate of 95%. Obviously, with the short interval follow up, success rate can be related to the minimization of acute and subacute toxicities. The grade 3 or higher acute toxicities were 9.2% or less for mucositis, dermatitis, dysphagia, and esophagitis, while grade 3 or higher late toxicities only included 3 patients with skin related issues such as soft tissue necrosis and mucocutaneous fistula. Only death during PBRT was one patient with disease progression. These results were presented at the Proton Therapy Co-Operative Group – North America 2014 meeting and is in submission for publication.

Conclusion

Head and neck cancers tend to recur loco-regionally with a high percentage requiring re-irradiation as part of or solely the curative option. Radiation with the highest conformality provides the best chance at cure with the least amount of collateral damage in tissues of the head and neck that have been heavily damaged from prior radiation. Our initial collaborative efforts have led to the use of PBRT as the best modality to fit the role of ultimate treatment for recurrent head and neck cancer.

To learn more about PBRT for Head and Neck Cancers, please contact the Northwestern Medicine Chicago Proton Center Intake Coordinators at 877.887.5807.

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