USE OF SIMULTANEOUS INTEGRATED BOOST IMRT TECHNOLOGY IN LARYNGEAL CARCINOMA

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Head and Neck cancer is one of the commonest cancers in Pakistan. Most of the patients present in advance stage. Laryngeal cancers account for 13% of head and neck cancer patients in our institution. Most of the advance laryngeal cancer patients treated with Chemoradiation have poor quality of life due to poor function of the preserved larynx, ultimately needing salvage laryngectomy. Therefore, Total laryngectomy followed by adjuvant radiotherapy remains the standard of care in T4 Laryngeal cancer patients. Conventional radiotherapy techniques result in increased acute as well as long term toxicity which impairs the quality of life, note ably xerostomia.[1]

Simultaneous Integrated Boost Intensity Modulated Radiation Therapy is an advance radiotherapy technique allowing sparing of organs at risk, while giving high and homogenous dose to the primary target. It allows shorter overall treatment time with hypofractionation and dose escalation to primary disease with high Biological Equivalent Dose (BED). In developing countries it serves to spare the resources in terms of equipment usage in shorter fractionations, providing equivalent local control with reduced toxicity profile [2], [3].

A case of laryngeal carcinoma treated with Total Laryngectomy followed by adjuvant radiotherapy of 60 Gy in 30 fractions was treated with Simultaneous Integrated Boost IMRT technique. A 66 years old male patient presented to an ENT clinic with 8 months history of hoarseness of voice. Biopsy revealed well differentiated Squamous Cell Carcinoma. Staging CT Neck with contrast showed Glottic tumor associated with supra and subglottic extension. There was no regional lymphadenopathy. The patient was planned for Total Laryngectomy. Histopathology showed moderately differentiated Squamous cell carcinoma, 3.5cm in size, invading through thyroid cartilage and focally invaded soft tissue of neck (pT4a), margins free of tumor, No Lymphovascular invasion or perineural invasion. No subglottic extension seen. 1 out of 47 lymph Nodes was positive. He had nutritional and dental assessment prior to radiotherapy.

CT for Radiotherapy treatment planning was done with patient positioned supine, immobilized with a thermoplastic mask with neck in extended position. CT images of 3mm slice thickness were acquired from vertex to carina. The clinical target volume was drawn on each CT slice using information from pre-operative imaging, operation notes and discussion with surgeon including sites at risk of microscopic disease. The CTV50 included areas of subclinical disease –the bilateral level Ib-V neck nodes. CTV60 included the tumor bed alone. PTV50 and PTV60 were formed by giving 5mm margin to CTV50 and CTV60 respectively as shown in Figure 1 & 2. OARs outlined included the brainstem, spinal cord, parotid glands, bilateral TMJ and choleca.

Simultaneous integrated Boost IMRT technique was used for treatment planning. PTV60 received 2.0Gy daily dose up to 30 fractions while PTV50 received a daily dose of 1.8Gy up to 30 fractions .The dose constraints for OARs were as follows: 40Gy maximum point dose to brainstem, maximum point dose of 40Gy to spinal cord, mean dose <30Gy to each parotid, mean dose of <50Gy to choleca, mean dose <60Gy to TMJ. Inverse planning was performed using Varian Eclipse Treatment Planning Software Version 11. This is shown in Figure 1, 2 & 3.
Treatment plan was evaluated using Dose Volume Histograms (DVH) and found the doses as: 95% of the prescribed dose (57.8Gy) to PTV60, 100% of the prescribed dose (50Gy) to PTV50, maximum dose of 41Gy to brainstem, maximum point dose of 43Gy to spinal cord, mean dose of 26Gy to parotid.

This patient completed the treatment in 6 weeks without any interruption Weekly clinical assessment was done during the treatment for this patient and he was assessed for the acute toxicity defined as side effects occurring during radiotherapy. This assessment included the grading of side effects according to CTC criteria version 3. He was assessed in the clinic at 6 weeks post radiotherapy. Acute skin toxicity and mucositis had settled and there was no xerostomia. Physical examination revealed no local or regional recurrence.

This concludes that Simultaneous Integrated Boost Intensity Modulated Radiotherapy technique allowed the treatment to be completed with higher doses to the target volumes sparing organs at risk with reduced acute toxicity profile. Patient returned to a good quality of life early with no xerostomia.

References:

