Three Dimensional Conformal Radiotherapy (3DCRT) for parotid gland cancer: Dose to cochlea, oral cavity and contralateral parotid

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Introduction: Parotid gland tumors constitute about 80% of all salivary gland tumors. About 80% of the tumors are located in the superficial lobe, and most of these tumors have an infra-auricular location. Postoperative radiation therapy is highly efficacious in decreasing the local recurrence in high risk patients. Adjuvant radiotherapy is commonly achieved with a pair of wedged oblique beams. However the beams may irradiate the surrounding organs at risk (OARs), in particular the cochlea, oral cavity, contralateral parotid, spinal cord and brain stem causing significant increase in the risk of oral mucositis, xerostomia, dry ear, ear infections, and hearing deficits on the irradiated side. So, proper selection of the beam direction to spare the OARs from receiving doses exceeding their tolerance values is considered an important factor when treating such patients.

Aim of work: This study is aiming at reporting the results of doses received by target volumes and surrounding organs at risk (OARs) during postoperative 3DCRT treatment of parotid gland cancer using ipsilateral 2 oblique wedged and direct lateral fields.

Methods: This study included ten patients diagnosed as having parotid cancer, underwent superficial parotidectomy and referred to Alexandria Clinical Oncology Department (ACOD), during the period from January 2011 to March 2012 for postoperative radiotherapy to the parotid bed. All the patients had at least one indication for post-operative radiotherapy. All patients had computed tomography (CT) simulation (3 mm slice thickness) during which they were immobilized. The CT data transferred to treatment planning system (Precise Elekta). All required structures were contoured including GTV, PTV, contralateral parotid, oral cavity, ipsilateral & contralateral cochlea, spinal cord, brain stem, eyes, lenses and optic nerves. All CT scans were planned, calculated and treated with 6 MV photon beams on a Precise Elekta linear accelerator. The dose of 60Gy was prescribed to the center of the PTV. For two cases as the spinal cord maximum dose was high so the dose was reduced in a way that the dose to spinal cord did not exceed its tolerance. For all plans, isodose distributions and dose volume histogram (DVH) were generated. The coverage of PTV was evaluated using the minimum and maximum dose. Dose inhomogeneity within PTV was calculated for all patients. Sparing of OARs was assessed using the mean dose for parotid & cochlea and oral cavity and the maximum point dose of spinal cord, brain stem, lenses, and optic nerves.

Results: Regarding PTV dose coverage; the average of minimum dose to PTV was 57 Gy and the average of maximum dose was 66 Gy and the percentage of the dose inhomogeneity within PTV was 15%. Regarding PTV dose conformity; 95% isodose wash closely matched the shape of PTV. Regarding OARs sparing, the average of the mean dose to contralateral parotid, oral cavity, ipsilateral, contralateral cochlea and both eyes was 8Gy, 36Gy, 15Gy, 4Gy and 120cGy respectively. The average of the maximum point dose to spinal cord, brain stem, both lenses and right and left optic nerve is 32Gy, 21Gy, 180cGy, 180cGy & 120cGy respectively. All values were far less than the corresponding organ tolerance.

Conclusion: Post-operative 3DCRT radiotherapy for parotid gland tumors using two oblique wedged and one direct lateral fields maintained OARs sparing without compromising dose coverage or conformity of PTV. So this technique may be considered as a class solution for the treatment of parotid gland tumors without the need to a complex technique as IMRT especially in radiotherapy centers lacking IMRT