

Intensity-Modulated Radiation Therapy (IMRT) for the Para-Nasal Sinus (PNS) Malignancies

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Tumors of the paranasal sinuses are rare among the head and neck cancers and comprises <1% of all malignancies. Given proximity to the critical structures such as skull base, central nervous system, optic apparatus and orbits, these cancers pose a therapeutic challenge, particularly because these cancers present at an advanced stages. As majority of these patients at advanced stages, these are treated using radiation therapy with or without surgical resection. In resectable patients, surgery followed by postoperative RT is (64-74 Gy) considered standard by many centers. RT alone (70-74 Gy) along with concurrent chemotherapy is recommended in patients with unresectable disease. Elective nodal irradiation (ENI) is not considered standard due to low incidence of lymph node metastases among these patients except limited data from few centers on ENI for T3-4 stage tumors.

Radiation therapy using conventional techniques has been associated with a number of potentially severe complications, leading to radiation related injury to the visual apparatus. Ocular toxicity is a significant complication among patients treated for PNS tumors and the incidence of unilateral and bilateral blindness from radiation induced retinopathy and optic neuropathy has been as high as 30% and 10% respectively [1]. Published data showed poor local control rates for paranasal sinus malignancies with radiation therapy using different RT techniques due to the difficulties of air tissue interface

interactions as well as the close proximity to the optical apparatus. Intensity-modulated radiation therapy (IMRT) offers the potential to reduce dose to critical structures while maintaining desired doses to the gross tumor volume via optimized non-uniform beam intensities [2,3]. Various studies reported improved clinical outcomes of PNS tumors treated with IMRT with excellent local control and survival rates with minimal complications including our experience at Fox Chase Cancer Center (FCCC) [4]. 31 patients with PNS malignancies were treated at FCCC with IMRT to a median dose of 60 Gy in 30 fractions. Median RT values to optic apparatus: Optic chiasm D_{max} 22 Gy (range: 1-48); right and left optic nerve D_{max} were 39, 37 Gy (range: 2-62; 2-65). At a median follow up of 27 months (range: 4-98), the 2- and 5-year local control and overall survival rates were 89%, 82% and 75%, 66%, respectively (Table 1). The 2-year loco-regional control rates were 89% for stage I/II and 79% for stages III/IV. There were no grade 3 or 4 ocular or salivary function related toxicities in our experience. IMRT appears to be a safe, effective treatment for para-nasal sinus malignancies.

References

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| Institution | No. of patients | 5-year Local control rate | 5-year Overall survival |
|-----------------------------------|-----------------|---------------------------|-------------------------|
| Duprez F, Ghent Univ, Belgium (2) | 130 | 59% | 52% |
| Wiegner EA, UCSF (3) | 52 | 64%* @ 2 years | 66% @ 2 years |
| Cattaneo R, FCCC (4) | 31 | 82% | 66% |

*Loco-regional control rate at 2 years

Table 1: Local control and survival rates.

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