

Background

- Dosimetric properties of proton therapy enable delivery of highly conformal doses of radiation to clinical targets and reduced doses to organs at risk than intensity modulated radiation therapy (IMRT)
- In head and neck cancer, reducing high dose target volume expansions minimizes excess dose of radiation to organs adjacent to the oropharynx potentially reducing the risk of xerostomia, dysphagia, and aspiration
- With IMRT, several experiences reported excellent clinical outcomes with minimal to no expansion of the high-dose gross tumor volume (GTV), an attractive avenue to reduce dose to normal tissue. No such studies have been done with IMPT
- Given the favorable oncologic outcomes of patients with p16+ oropharyngeal cancer (p16+OPC), exploring reduction in target volume with IMPT is a reasonable approach to reduce late toxicity

Materials and Methods

- Single-institution retrospective review of patients with non-metastatic, p16+OPC treated at our center with definitive IMPT from 2016 to 2021
- Acute and late toxicities graded according to CTCAE v5.0
- Chi-square analysis used to compare patients without GTV expansions to those with GTV expansions

References

1. Burr AR, Harari PM, Ko HC, Bruce JY, Kimple RJ, Witek ME. Reducing radiotherapy target volume expansion for patients with HPV-associated oropharyngeal cancer. *Oral Oncology*. 2019;92:52-56. doi:10.1016/j.oraloncology.2019.03.013
2. Chen AM, Yu Y, Daly ME, Farwell DG, H. Benedict S, Purdy JA. Long-term experience with reduced planning target volume margins and intensity-modulated radiotherapy with daily image-guidance for head and neck cancer: Planning Volume for Head and Neck Cancer. *Head Neck*. 2014;36(12):1766-1772. doi:10.1002/hed.23532

Results

Table 1. Patient, tumor and treatment characteristics

	0mm GTV expansion (n=12)	Any GTV expansion (n=33)	p-value
Sex – no. (%)			0.53
Male	12 (100)	31 (94)	
Race – no. (%)			0.62
White	11 (92)	31 (94)	
Smoking History – no. (%)			0.65
Yes	8 (67)	22 (67)	
>10 pack year history – no. (%)			0.19
Yes	6 (75)	10 (45)	
Primary Site – no. (%)			0.36
Tonsil	8 (67)	15 (45)	
BOT	4 (33)	17 (52)	
Soft Palate	0	1 (3)	
T stage – no. (%)			0.005
T1	0	9 (27)	
T2	3 (25)	22 (67)	
T3	3 (25)	2 (6)	
T4	6 (50)	0	
N Stage (AJCC 7th) – no. (%)			0.40
N0	1 (8)	8 (24)	
N+	11 (91)	25 (76)	
N Stage (AJCC 8th) – no. (%)			0.44
N0	1 (8)	8 (24)	
N+	11 (92)	25 (76)	
Concurrent chemotherapy – no. (%)			0.23
No	3 (25)	8 (24)	
Yes	9 (75)	25 (76)	
Radiation Dose – median (range)	70 Gy (64-70)	70 Gy (56-74)	0.50

Table 2. Acute and late toxicities

Acute toxicity (n=45)	G1	G2	G3
Dermatitis	25 (56%)	7 (16%)	3 (7%)
Mucositis	21 (47%)	14 (31%)	3 (7%)
Dysgeusia	24 (53%)	15 (33%)	0
Dysphagia	20 (44%)	9 (20%)	5 (11%)
Fatigue	23 (51%)	7 (16%)	1 (2%)
Pain	20 (44%)	14 (31%)	3 (7%)
Xerostomia	29 (64%)	7 (16%)	0
Nausea	11 (24%)	8 (18%)	1 (2%)
Odynophagia	1 (2%)	3 (7%)	1 (2%)
Weight loss	21 (47%)	12 (27%)	0
Late toxicity (n=45)			
Dysgeusia	13 (29%)	0	0
Dysphagia	9 (20%)	1 (2%)	0
Fatigue	4 (9%)	0	0
Pain	1 (2%)	0	0
Xerostomia	22 (49%)	1 (2%)	0

Table 3. Patient toxicities stratified by GTV margin status

	0mm GTV expansion (n=12)	Any GTV expansion (n=33)	p- value
Any acute grade 2	8 (67%)	23 (70%)	0.32
Any acute grade 3	1 (8%)	10 (30%)	0.17

- The proportion of patients who experienced acute grade 2 toxicity was fairly similar between the two groups, 67% versus 70%
- While the proportion of patients who experienced acute grade 3 toxicity was less in the cohort without GTV expansion, 8% versus 30%, this was not statistically different

Conclusions

- Limiting high-dose target volume expansions in patients receiving photon-based intensity modulated radiotherapy is associated with a reduction in severity, frequency, and duration of treatment-related side effects
- These findings represent the first data supporting a limited high-dose target expansions in patients with p16+OPC treated with IMPT as an approach to minimize radiation-related side effects