



Increased Frequency of Esophageal Stenosis Following Simultaneous Modulated Accelerated Radiation Therapy (SMART) and Chemotherapy for Head and Neck Cancer

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INTRODUCTION

Chronic esophageal toxicity following radiotherapy (RT) alone for cancer of the head and neck (HNCa) is rare: 2.6% for strictures and 0.8% for stenosis after 60 Gy. With combined modality therapy (CMT), stricture rates of 22-37% have been reported. We report frequency of esophageal toxicity following simultaneous modulated accelerated radiation therapy (SMART) with chemotherapy for HNCa.

MATERIALS & METHODS

The records of the Otolaryngology/Head and Neck Surgery Department of Emory University were screened for patients undergoing CMT for HNCa; 99 patients were included in this analysis. Radiation Oncology records for reviewed for dosimetry and prescription data. Hospital and Clinic records were reviewed for evidence of esophageal toxicity.

		Number (%)
	Total Patients	99
Primary Site	Oral Cavity	1 (1%)
	Oropharynx	68 (69%)
	Nasopharynx	7 (7%)
	Hypopharynx	8 (8%)
	Larynx	9 (9%)
	Unknown	6 (6%)
T Stage	x	6 (6%)
	1	22 (22%)
	2	25 (25%)
	3	16 (16%)
	4	30 (30%)
N Stage	0	9 (9%)
	1	9 (9%)
	2 (Nasopharynx only)	5 (5%)
	2a	12 (12%)
	2b	35 (35%)
	2c	21 (21%)
	3	8 (8%)

RESULTS

Pt.	T Stage/Site	N Stg	Chemotherapy	Radiation Dose, Dose/Fx	Description of Dysfunction	F/U	Disease Status
1	T4- oropharynx	2c	Weekly carbo/taxol	69.96Gy, 2.12Gy/fx	Complete stenosis	107	DM to lungs
2	T2- Lt Tonsil	2b	Cisplatin x 3	69.96Gy, 2.12Gy/fx	Cervical esophageal stricture	799	NED
3	T4- Rt Pyriform Sinus	2c	Cisplatin x 3	70.29Gy, 2.13Gy/fx	Cervical esophageal stricture	294	NED
4	T1- Rt BOT	2b	Cisplatin x 3	70.29Gy, 2.13Gy/fx	Cervical esophageal stricture	134	NED
5	T1- Oropharyngeal	2b	Cisplatin x 3	69.96Gy, 2.12Gy/fx	Cervical esophageal stricture	600	NED
6	T2- Rt BOT	0	Cisplatin x 2	70.29Gy, 2.13Gy/fx	Cervical esophageal stricture	474	NED
7	T1- Lt Tonsil	2c	Cisplatin x 3	70.29Gy, 2.13Gy/fx	Cervical esophageal stricture	291	DM to mediastinal LN
8	T4- Rt BOT	2b	Weekly carbo/taxol	70.29Gy, 2.13Gy/fx	Cervical esophageal stricture	260	NED
9	T2- NPX	2c	Cisplatin x 2, then weekly carbo/taxol	69.76Gy, 2.18Gy/fx	Complete stenosis	890	NED
10	T4- Rt Tonsil	2b	Cisplatin x 1, then weekly carbo/taxol	70.29Gy, 2.13Gy/fx	Cervical esophageal stricture	359	NED
11	T2- Lt BOT	1	Cisplatin x 1, then weekly carbo/taxol	70.29Gy, 2.13Gy/fx	Complete stenosis	242	NED
12	T3- Lt BOT	2c	Weekly carbo/taxol	70.29Gy, 2.13Gy/fx	Complete stenosis	217	NED
13	T4b- Hypopharynx	2b	Weekly carbo/taxol	70.29Gy, 2.13Gy/fx	Complete stenosis	390	NED

Patients with Esophageal Stricture or Stenosis										
	Esophagus Dose (Gy)					Supraglottic Larynx Dose (Gy)				
	Min	Max	Mean	V ₅₀	V ₆₀	Min	Max	Mean	V ₅₀	V ₆₀
Mean	39.35	72.64	60.26	84	52	41.32	71.54	58.30	86	60
Median	40.08	72.95	59.69	89	49	41.66	71.61	59.54	98	58
Min	24.34	70.79	55.08	58	27	18.14	68.27	44.89	43	26
Max	49.32	74.92	67.64	100	88	60.23	74.14	65.48	100	100
Std Dev	9.44	1.58	4.66	16	21	14.58	2.39	7.09	20	31
Patients without Esophageal Stricture or Stenosis										
	Esophagus Dose (Gy)					Supraglottic Larynx Dose (Gy)				
	Min	Max	Mean	V ₅₀	V ₆₀	Min	Max	Mean	V ₅₀	V ₆₀
Mean	32.96	71.55	56.26	83	30	41.08	71.03	57.95	85	40
Median	32.07	71.21	56.48	91	29	43.69	71.65	59.96	96	49
Min	24.72	69.98	51.15	46	16	25.73	65.79	48.48	36	4
Max	44.95	73.37	61.09	98	58	53.81	73.73	62.47	100	66
Std Dev	6.98	1.33	2.90	18	13	10.13	2.82	4.77	22	25
p value*	0.16	0.13	0.13	0.64	0.038	1.00	0.72	0.88	0.65	0.23

From January 2003 to August 2005, 99 patients underwent definitive therapy for squamous cell HNCa using SMART and chemotherapy. Follow-up was documented in all cases. Median dose to sites of gross primary or nodal disease was 70.29 Gy, at 2.13Gy/fx. Median dose to the ipsilateral neck was 63.03Gy at 1.91Gy/fx. Median dose to the contralateral neck in 97 patients treated was 57.75Gy at 1.75Gy/fx. Thirteen (13%) patients developed esophageal strictures and five (5%) had complete esophageal stenosis. Four of the 29 patients (14%) with either a hypopharyngeal primary (n=8) or N2c nodal disease (n=21) developed complete stenosis. A statistically larger esophageal V₆₀ was found in patients who developed stenosis/stricture when compared with a randomly selected population of N2a/b patients who did not develop those toxicities.

CONCLUSIONS

The risk of severe esophageal toxicity may increase with increasing aggressiveness of therapy for HNCa. Using SMART, dose per fraction to gross disease exceeds 2.1Gy. When given with concurrent chemotherapy, frequency of esophageal toxicity increases. Potential mechanisms to reduce this likelihood include (a) contouring the esophagus either as a dose-limiting or avoidance stricture; (b) early flexible examination post-treatment, with early intervention with dilation; (c) improved therapy of mucositis. In these data, esophageal V₆₀ emerged as a potential prognostic factor for esophageal stricture or stenosis.