

Impact of Intensity Modulated Radiation Therapy on Acute Toxicity in Locally Advanced Lung Cancer: Results of a Large Statewide Multi-center Cohort

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PURPOSE / OBJECTIVE(s)

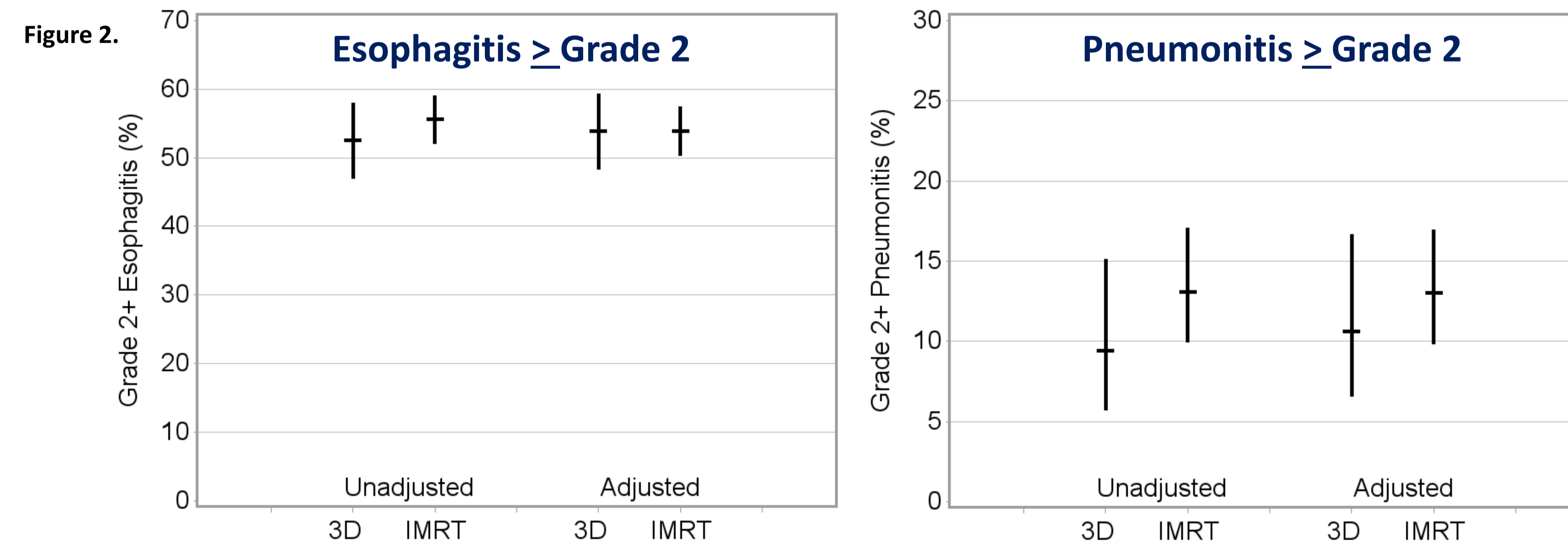
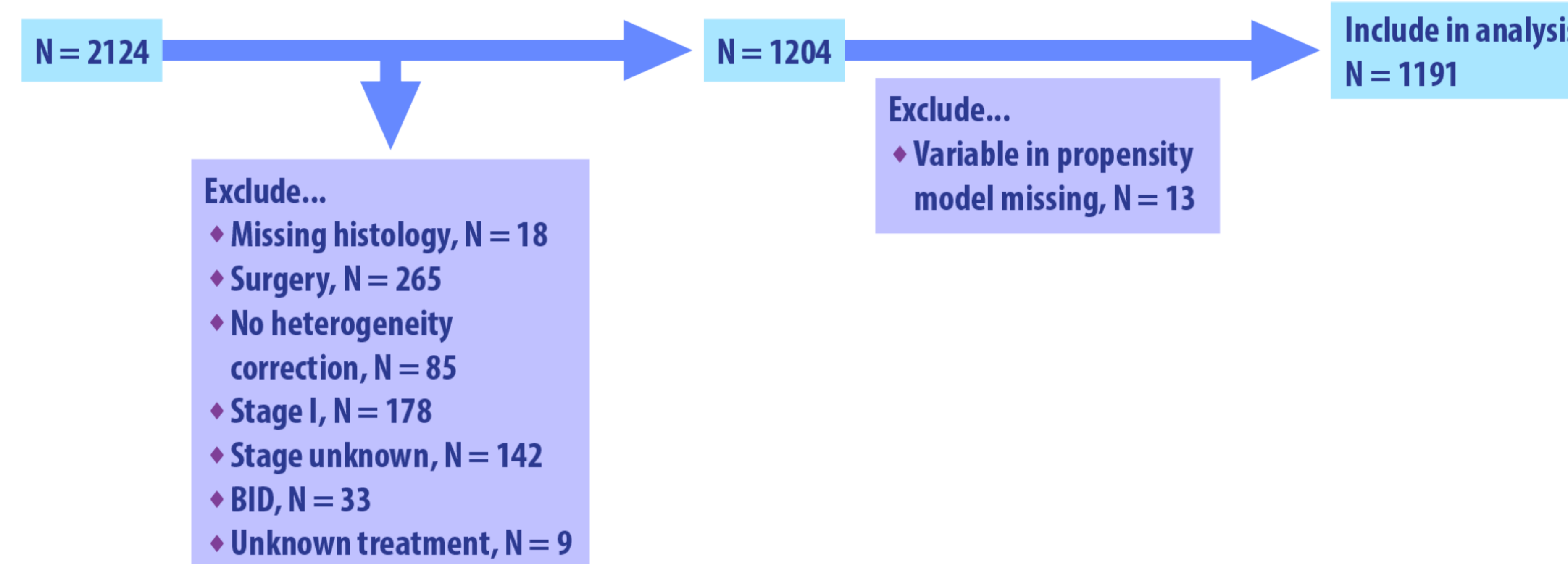
Secondary analysis of RTOG 0617 has shown lower rates of pneumonitis and less decline in patient quality of life with the use of intensity modulated radiation therapy (IMRT) vs. three-dimensional conformal external beam radiation therapy (3D-CRT) in locally advanced non-small cell lung cancer patients undergoing definitive radiation therapy. In a large statewide radiation oncology quality consortium, we sought to evaluate impact of IMRT vs. 3D-CRT treatment technique on acute esophagitis & pneumonitis.

MATERIAL & METHODS

From 2013 to 2017, 2124 patients with nonmetastatic lung cancer were enrolled in the consortium. Physician reported toxicity by CTCAE and patient reported outcomes using FACT Lung Cancer Subscale (LCS) and FACT Trials Outcome Index (TOI) were collected at 1, 3 and 6 months from the end of radiation. We compared physician and patient reported quality of life by treatment technique. Normal tissue dose volume constraints and PTV objectives were not prospectively controlled. To account for differences in prognostic factors between IMRT and 3D-CRT patients, we performed inverse probability of treatment weighting (IPTW) via a propensity score. The propensity score was estimated via a logistic regression model and included age, smoking status, comorbidities, stage, PTV volume, chemotherapy, prescription dose, total number of structures and individual structures (e.g. esophagus, heart) within 2 cm of the PTV.

RESULTS

Figure 1. CONSORT Diagram.



- 1204 non-surgical locally advanced lung cancer patients met inclusion criteria. After excluding patients with missing variables, 1191 (86%) were included in the analysis.
- 31% were treated with 3D-CRT and 69% were treated with IMRT.
- IMRT patients had significantly larger PTVs (mean 370 vs. 474cc) and were more likely to be stage IIIB (24% v vs. 32%)
- No significant differences between 3D-CRT and IMRT in rates of esophagitis (p=0.76) or pneumonitis (p=0.80).
- At 6 mos after completion of RT with a compliance of 45%, 3D-CRT and IMRT resulted in similar proportions of patient experiencing a decline of ≥2 points on LCS (38% vs. 45%, p=0.33) and ≥5 points on TOI (48% vs. 54%, p=0.72).

Metric	3D Median (IQR)	IMRT Median (IQR)	Table 1. IMRT vs. 3D: dosimetric factors weighted.
PTV Volume (cc)	360 (221, 581)	360 (215, 584)	
PTV Mean Dose (Gy)	62 (61, 66)	63 (61, 67)	
PTV D95 (Gy)	59 (54, 60)	60 (57, 63)	
Lung Mean Dose (Gy)	15 (13, 17)	15 (12, 18)	
Lung V5 (%)	47 (42, 58)	62 (51, 71)	
Lung V20 (%)	25 (20, 29)	26 (20, 31)	
Esophagus Mean Dose (Gy)	24 (17, 31)	23 (16, 29)	
Esophagus D2cc (Gy)	53 (35, 61)	58 (45, 63)	
Heart Mean Dose (Gy)	10 (5, 20)	12 (5, 18)	
Heart V5 (%)	40 (17, 60)	49 (23, 81)	

Subgroup	N Total	N 3D	Esophagitis (G2+)			Pneumonitis (G2+)			Table 2. IMRT vs. 3D in pre-specified subgroups.
			OR (IMRT vs 3D)	p value	95% CI	OR (IMRT vs 3D)	p value	95% CI	
PTV Volume in upper 33% (> 500 cc)	365	80	0.86	0.66	(0.43, 1.71)	0.83	0.74	(0.28, 2.51)	
4 or more structures within 2cm of PTV	154	27	1.01	0.99	(0.25, 4.08)	1.73	0.57	(0.24, 12.60)	
Stage IIIB	341	74	0.97	0.92	(0.45, 2.06)	1.06	0.91	(0.35, 3.24)	
Stage N3	159	44	0.84	0.68	(0.34, 2.05)	2.11	0.37	(0.21, 21.13)	

SUMMARY / CONCLUSION

In these data from a statewide consortium of academic and community radiation oncology practices, despite the PTV being larger among patients treated with IMRT vs 3D-CRT, no significant difference in acute esophagitis or pneumonitis by radiation treatment technique was found. Further analysis is underway seeking to use patient variables and dose relationships to identify a subgroup of patients in which IMRT may reduce toxicity relative to 3D-CRT.