

INTRODUCTION

Locally advanced NSCLC (LA-NSCLC) requires a balance between locoregional control and toxicity.SIB-IMRT allows selective dose escalation to gross tumor while delivering lower doses to subclinical regions in a single course. Real-world evidence for SIB-IMRT,especially in the immunotherapyera, remains limited. Aim: To compare SIB-IMRT vs. conventional IMRT in terms of efficacy, dosimetry, and safety in LANSCLC.

METHODS

Design:Single-center retrospective cohort (2017–2023)

Patients: Stage III NSCLC, definitive thoracic IMRT, KPS ≥70; 187 included (SIB- IMRT n=89, conventional n=98).

Prescription:

SIB-MRT: PGTV median 63 Gy/28 fx (BED₁₀ ~77.2 Gy), PTV 56 Gy/28 fx (BED₁₀ ~67.2 Gy).Conventional: PTV 60 Gy/30 fx (BED₁₀=72 Gy)

Endpoint: Primary =locoregional recurrence- free survival (LRFS); secondary = OS, PFS, DMFS, ORR, dosimetry, toxicity (CTCAE v5.0).

Statistics: Kaplan- Meier, log- rank, Cox regression

DISCUSSION AND CONCLUSION

SIB-IMRT significantly improved 3-year LRFS (74.0% vs. 61.4%) and reduced radiation pneumonitis (28.1% vs. 44.9%), despite lower immunotherapy use in the SIB-IMRT arm. Dosimetric advantages: lower mean lung dose, spinal cord dose, and esophageal maximum dose, without increasing heart exposure. The LRFS benefit did not translate into OS/PFS gains, possibly due to unbalanced immunotherapy and the dominant impact of distant metastases on PFS.

REFERENCES & ACKNOWLEDGEMENTS

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RESULTS

Table 1 Baseline clinicopathologic characteristics.

Characteristic	SIB-IMRT (n=89)	Conventional IMRT (n=98)	P value
Age, years			0.464
≤65	52 (58.4%)	52 (53.1%)	
>65	37 (41.6%)	46 (46.9%)	
Sex			0.569
Male	78 (87.6%)	83 (84.7%)	
Female	11 (12.4%)	15 (15.3%)	
Smoking history			0.192
No	38 (42.7%)	51 (52.0%)	
Yes	51 (57.3%)	47 (48.0%)	
Immunotherapy (neoadjuvant/adjuvant)			<0.001
No	66 (74.2%)	40 (40.8%)	
Yes	23 (25.8%)	58 (59.2%)	
KPS score			1.000
≥80	88 (98.9%)	97 (99.0%)	
<80	1 (1.1%)	1 (1.0%)	
Histology			0.124
Squamous cell carcinoma	50 (56.2%)	53 (54.1%)	
Adenocarcinoma	39 (43.8%)	41 (41.9%)	
Other NSCLC	0	4 (4.1%)	
TNM stage			0.976
IIIA	20 (22.5%)	24 (24.5%)	
IIIB	48 (53.9%)	50 (51.0%)	
IIIC	21 (23.6%)	24 (24.5%)	
T stage			0.190
T1	8 (8.9%)	7 (7.1%)	
T2	21 (23.6%)	32 (32.7%)	
T3	30 (33.7%)	22 (22.4%)	
T4	30 (33.7%)	37 (37.8%)	
N stage			0.531
N0	3 (3.4%)	3 (3.1%)	
N1	5 (5.6%)	7 (7.1%)	
N2	43 (48.3%)	39 (39.8%)	
N3	38 (42.7%)	49 (50.0%)	
Supraclavicular lymph-node metastasis	25 (28.1%)	33 (33.7%)	0.410
PTV volume, mL, median (range)	322.41 (102.30-839.38)	339.70 (69.65-736.24)	0.440

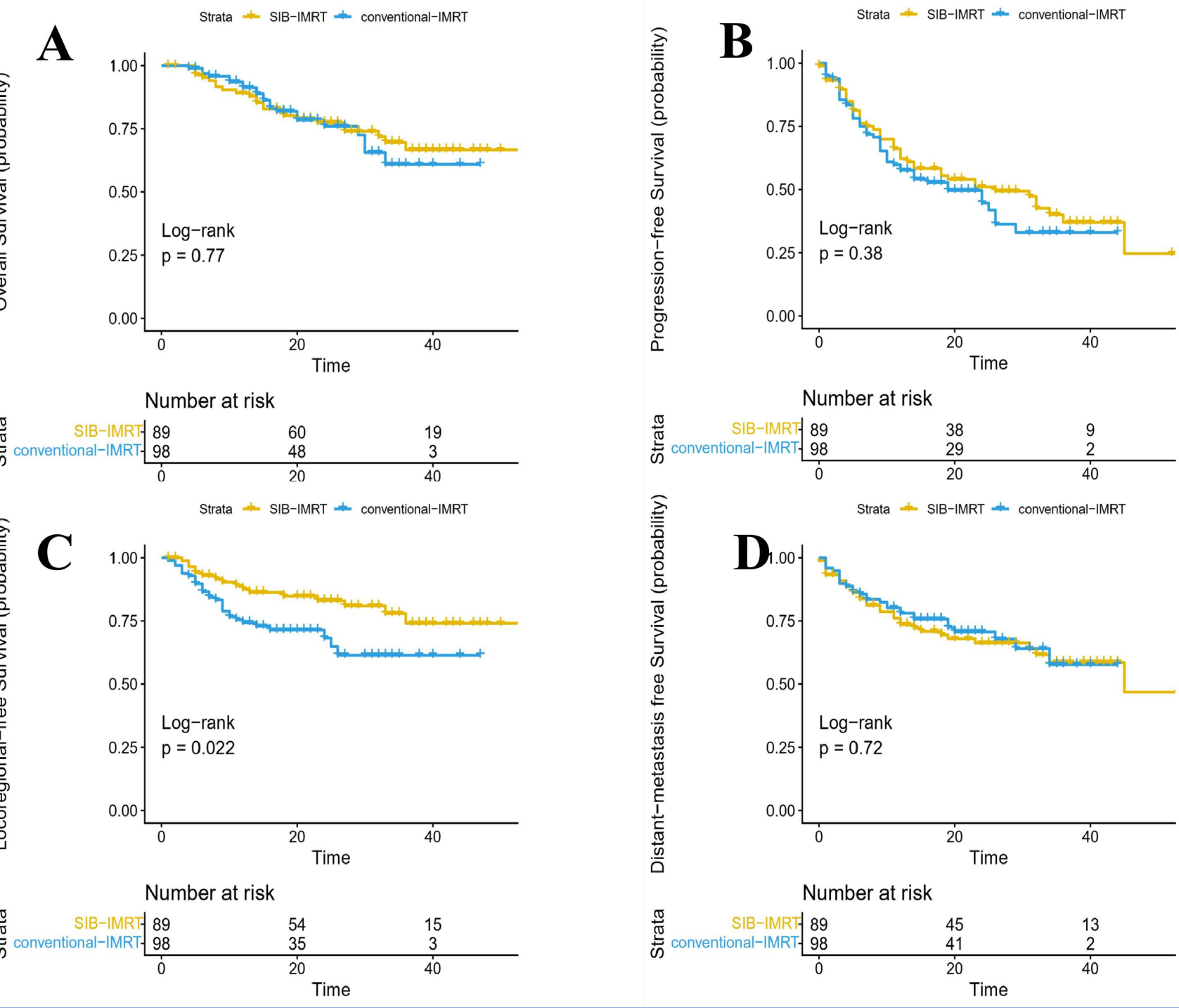
The two groups were well balanced in baseline characteristics (age, sex, smoking history, KPS, histology, TNM/T/N stage, supraclavicular metastasis, and PTV volume), but immunotherapy use differed significantly: 23 (25.8%) in the SIB-IMRT group vs. 58 (59.2%) in the conventional IMRT group (P<0.001).

Table 2 Univariable and multivariable Cox regression analysis for locoregional recurrence-free survival.

Variable	Univariable HR (95% CI)	P value	Multivariable HR (95% CI)	P value
Sex				
Male	Reference		Reference	
Female	0.131 (0.018-0.955)	0.045	0.301 (0.038-2.368)	0.254
Age, years	1.037 (1.000-1.076)	0.053	1.028 (0.990-1.068)	0.147
Smoking history				
Yes	Reference		Reference	
No	0.428 (0.224-0.820)	0.011*	0.594 (0.300-0.776)	0.135
Immunotherapy				
Yes	Reference		Reference	
No	2.560 (1.377-4.762)	0.003*	2.133 (1.106-4.113)	0.024*
SIB-IMRT				
Yes	Reference		Reference	
No (conventional IMRT)	2.623 (1.220-5.639)	0.014*	1.899 (1.012-3.563)	0.046*
Supraclavicular lymph-node metastasis				
Yes	Reference		Reference	
No	0.813 (0.434-1.524)	0.518		
PTV volume, mL	1.003 (1.001-1.005)	0.004*	1.002 (1.000-1.005)	0.023*

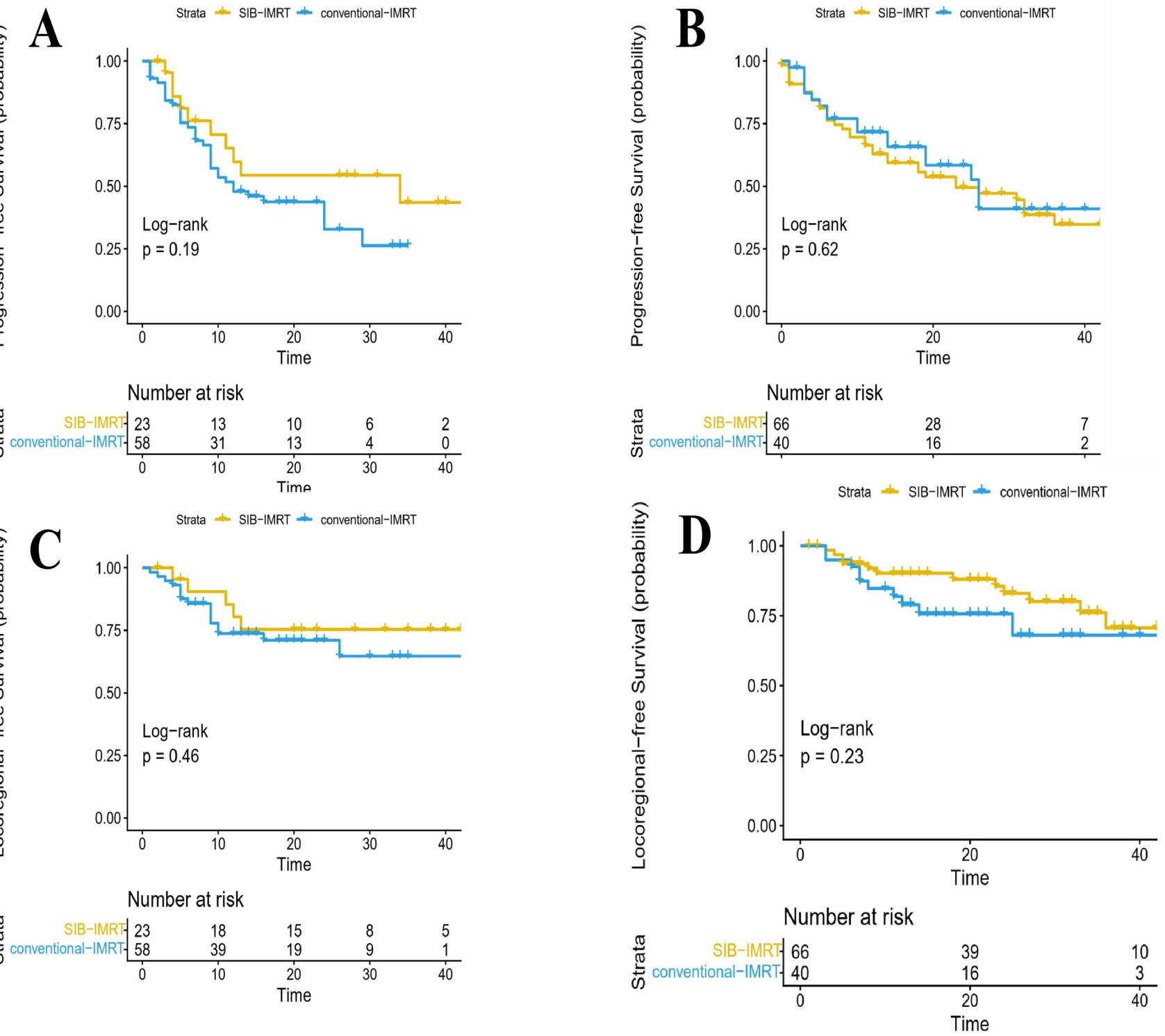
Independent predictors of worse LRFS: no immunotherapy (HR=2.133), conventional IMRT (HR=1.899), and larger PTV volume (HR=1.002); all P<0.05.

Figure 1. Kaplan-Meier survival curves according to radiotherapy technique.



SIB-IMRT significantly improved locoregional recurrence-free survival versus conventional IMRT (P=0.022), but no significant differences were seen for overall survival, progression-free survival, or distant metastasis-free survival (all P>0.05).

Figure 2 Immunotherapy subgroup survival analysis.



Immunotherapy subgroup analyses showed no significant differences between techniques; SIB-IMRT trended toward better PFS only in the immunotherapy subgroup (P=0.19), while LRFS numerically favored SIB-IMRT in both subgroups (all P>0.05).

Table 3. Treatment-related toxicities.

Adverse event	SIB G1	SIB G2	SIB G3	SIB G4+	IMRT G1	IMRT G2	IMRT G3	IMRT G4+	P value
Radiation pneumonitis	10 (11.2%)	15 (16.9%)	0	0	16 (16.3%)	25 (25.5%)	3 (3.1%)	0	0.017
Radiation esophagitis	16 (18.0%)	5 (5.6%)	0	0	24 (24.5%)	10 (10.2%)	1 (1.0%)	0	0.060
Radiation dermatitis	6 (6.7%)	2 (2.2%)	0	0	6 (6.1%)	4 (4.1%)	1 (1.0%)	0	0.579
Leukopenia	16 (18.0%)	20 (22.5%)	3 (3.4%)	1 (1.1%)	21 (21.4%)	16 (16.3%)	9 (9.2%)	3 (3.1%)	0.408
Thrombocytopenia	11 (12.4%)	5 (5.6%)	3 (3.4%)	0	10 (10.2%)	9 (9.2%)	8 (8.2%)	3 (3.1%)	0.080
Anemia	31 (34.8%)	10 (11.2%)	3 (3.4%)	0	29 (29.6%)	10 (10.2%)	4 (4.1%)	0	0.531

SIB-IMRT significantly lowered the overall incidence of radiation pneumonitis (28.1% vs 44.9%, P=0.017) and caused no grade ≥3 pneumonitis, whereas rates of esophagitis, dermatitis, and hematologic toxicities were similar between groups (all P>0.05).

Table 4. Organs-at-risk dosimetric parameters.

Parameter	SIB-IMRT, median (range)	Conventional IMRT, median (range)	P value
Mean lung dose, Gy	13.93 (6.92-20.70)	15.28 (7.34-19.02)	<0.001*
Maximum esophageal dose, Gy	60.96 (32.86-72.16)	62.91 (33.86-66.89)	0.023*
Mean esophageal dose, Gy	21.91 (5.46-38.70)	22.09 (6.05-44.32)	0.933
Mean heart dose, Gy	10.74 (0.80-33.70)	11.07 (0.61-30.04)	0.555
Maximum spinal cord dose, Gy	37.34 (24.28-47.49)	39.68 (10.76-47.90)	0.004
Lung V5, %	53.82 (26.01-88.35)	54.55 (30.21-76.32)	0.203
Lung V10, %	42.27 (17.74-63.66)	43.06 (15.91-61.70)	0.546
Lung V20, %	26.42 (11.48-51.25)	25.87 (7.12-50.02)	0.999
Lung V30, %	16.04 (3.79-43.79)	16.37 (2.79-42.36)	0.898
Esophagus V40, %	26.55 (0-58.53)	25.37 (1.18-56.62)	0.663
Esophagus V50, %	17.58 (0-53.40)	16.18 (0.81-52.72)	0.948
Heart V30, %	11.82 (0-55.41)	11.84 (0.48-38.03)	0.574
Heart V40, %	8.62 (0-39.98)	7.87 (0.38-34.53)	0.731

SIB-IMRT significantly reduced mean lung dose (P<0.001), maximum esophageal dose (P=0.023), and maximum spinal cord dose (P=0.004) versus conventional IMRT. No significant differences were observed for other lung, esophageal, or heart dose-volume parameters (all P>0.05).