

Supplementary Table 1. Quantitative comparison of the isodose dice between Conv and TMR10 dose for different size of dose distribution.

Prescription Isodose dice	Size of dose distribution			
	$512 \times 512 \times Z$ (ground truth)	$256 \times 256 \times Z$	$128 \times 128 \times Z$	$64 \times 64 \times Z$
Spatial resolution (mm ³)	$1 \times 1 \times 1$	$2 \times 2 \times 1$	$4 \times 4 \times 1$	$8 \times 8 \times 1$
120%	0.83 ± 0.11	0.83 ± 0.11	0.83 ± 0.11	0.83 ± 0.11
100%	0.89 ± 0.05	0.89 ± 0.05	0.89 ± 0.05	0.89 ± 0.06
90%	0.91 ± 0.04	0.91 ± 0.04	0.91 ± 0.04	0.91 ± 0.04
50%	0.93 ± 0.03	0.93 ± 0.03	0.93 ± 0.03	0.93 ± 0.03

Supplementary Table 2. Quantitative comparison of the difference between Conv and sConv dose. Time (s) for $128 \times 128 \times 172$ volume generation.

Model	Prescription Isodose dice	DDIM 200	DDIM 100	DDIM 50	DDIM 32	DDIM 16	DDIM 8	DDIM 4	DDIM 2
DoseDiff [50]	120%	0.94 ± 0.03	0.92 ± 0.03	0.34 ± 0.16					
	100%	0.96 ± 0.02	0.95 ± 0.02	0.95 ± 0.02	0.95 ± 0.02	0.96 ± 0.02	0.95 ± 0.02	0.94 ± 0.02	0.29 ± 0.14
	90%	0.96 ± 0.02	0.94 ± 0.03	0.23 ± 0.12					
	50%	0.97 ± 0.02	0.92 ± 0.02	0.12 ± 0.06					
	Time (s)	3280	1640	820	576	288	144	72	36
Conditonal DDPM [7]	120%	0.94 ± 0.03	0.88 ± 0.03	0.21 ± 0.11					
	100%	0.95 ± 0.02	0.90 ± 0.02	0.16 ± 0.09					
	90%	0.96 ± 0.03	0.96 ± 0.02	0.91 ± 0.03	0.14 ± 0.07				
	50%	0.97 ± 0.02	0.96 ± 0.02	0.85 ± 0.03	0.10 ± 0.05				
	Time (s)	2800	1400	700	448	224	112	56	28
Conditional Wavelet DDPM [12]	120%	0.91 ± 0.06	0.91 ± 0.05	0.91 ± 0.05	0.90 ± 0.06	0.90 ± 0.06	0.90 ± 0.06	0.89 ± 0.08	0.92 ± 0.03
	100%	0.95 ± 0.03	0.95 ± 0.03	0.94 ± 0.03	0.94 ± 0.03				
	90%	0.95 ± 0.02	0.96 ± 0.03	0.95 ± 0.03	0.95 ± 0.03	0.95 ± 0.03	0.95 ± 0.03	0.94 ± 0.03	0.94 ± 0.03
	50%	0.96 ± 0.02	0.95 ± 0.02	0.95 ± 0.02					
	Time (s)	96	48	24	12	6	3	1.5	0.8

Supplementary Table 3. Additional quantitative comparison of the difference between Conv and sConv dose. Time (s) for $128 \times 128 \times 172$ volume generation.

Model	Metric diff	DDIM 200	DDIM 100	DDIM 50	DDIM 32	DDIM 16	DDIM 8	DDIM 4	DDIM 2
DoseDiff [50]	D _{max} (Gy)	0.49 ± 0.31	0.48 ± 0.30	0.50 ± 0.31	0.49 ± 0.31	0.50 ± 0.31	0.47 ± 0.30	0.64 ± 0.52	3.62 ± 0.56
	D _{mean} (Gy)	0.37 ± 0.44	0.37 ± 0.44	0.37 ± 0.43	0.37 ± 0.44	0.38 ± 0.46	0.39 ± 0.44	0.70 ± 0.42	2.67 ± 0.90
	D _{min} (Gy)	1.16 ± 0.94	1.17 ± 0.94	1.11 ± 0.93	1.16 ± 0.94	1.17 ± 0.92	1.20 ± 0.97	1.70 ± 1.21	12.4 ± 3.82
	V ₉₅ (%)	0.72 ± 1.25	0.73 ± 1.25	0.72 ± 1.25	0.72 ± 1.25	0.73 ± 1.25	0.75 ± 1.29	1.14 ± 2.07	5.07 ± 1.95
	D ₉₅ (Gy)	0.71 ± 0.69	0.71 ± 0.70	0.69 ± 0.63	0.71 ± 0.69	0.71 ± 0.69	0.75 ± 0.71	1.20 ± 0.71	3.53 ± 1.17
	D ₅₀ (Gy)	0.31 ± 0.31	0.30 ± 0.28	0.31 ± 0.29	0.31 ± 0.30	0.31 ± 0.32	0.31 ± 0.30	0.60 ± 0.41	3.64 ± 1.19
	HI	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.02	0.04 ± 0.03	0.24 ± 0.05
	CI	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.02	0.05 ± 0.02	0.02 ± 0.02	0.03 ± 0.01	0.52 ± 0.12
Time (s)	3280	1640	820	576	288	144	72	36	
cDDPM [7]	D _{max} (Gy)	0.48 ± 0.35	0.43 ± 0.36	0.45 ± 0.34	0.49 ± 0.38	0.49 ± 0.41	0.46 ± 0.32	2.25 ± 1.03	3.62 ± 0.56
	D _{mean} (Gy)	0.41 ± 0.39	0.44 ± 0.50	0.42 ± 0.42	0.44 ± 0.49	0.43 ± 0.46	0.43 ± 0.40	1.30 ± 0.51	2.95 ± 1.10
	D _{min} (Gy)	1.25 ± 1.01	1.19 ± 0.96	1.18 ± 1.03	1.23 ± 0.97	1.21 ± 1.03	1.27 ± 1.11	1.65 ± 1.19	16.39 ± 4.81
	V ₉₅ (%)	0.72 ± 1.22	0.66 ± 1.18	0.75 ± 1.29	0.74 ± 1.27	0.77 ± 1.29	0.79 ± 1.34	1.11 ± 1.94	6.93 ± 2.17
	D ₉₅ (Gy)	0.74 ± 0.66	0.77 ± 0.68	0.74 ± 0.60	0.76 ± 0.73	0.76 ± 0.66	0.81 ± 0.65	1.61 ± 0.82	5.18 ± 1.92
	D ₅₀ (Gy)	0.38 ± 0.32	0.38 ± 0.33	0.38 ± 0.31	0.39 ± 0.38	0.36 ± 0.29	0.35 ± 0.30	1.35 ± 0.73	4.40 ± 1.31
	HI	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.03	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.03	0.04 ± 0.04	0.28 ± 0.08
	CI	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.02	0.07 ± 0.03	0.59 ± 0.13
Time (s)	2800	1400	700	448	224	112	56	28	
Conditional Wavelet DDPM [12]	D _{max} (Gy)	0.89 ± 0.89	0.90 ± 0.92	0.86 ± 0.85	0.93 ± 0.77	0.96 ± 0.74	1.00 ± 0.73	0.99 ± 0.88	0.98 ± 0.94
	D _{mean} (Gy)	0.49 ± 0.50	0.53 ± 0.57	0.62 ± 0.56	0.66 ± 0.50	0.72 ± 0.50	0.73 ± 0.48	0.55 ± 0.49	0.45 ± 0.50
	D _{min} (Gy)	1.12 ± 1.13	1.13 ± 1.16	1.22 ± 1.12	1.36 ± 1.22	1.40 ± 1.21	1.44 ± 1.20	1.30 ± 1.14	1.12 ± 1.12
	V ₉₅ (%)	0.40 ± 1.00	0.39 ± 0.95	0.40 ± 0.97	0.42 ± 1.00	0.43 ± 1.00	0.39 ± 0.95	0.34 ± 0.87	0.31 ± 0.82
	D ₉₅ (Gy)	0.66 ± 0.48	0.70 ± 0.48	0.82 ± 0.48	0.87 ± 0.51	0.92 ± 0.52	0.92 ± 0.56	0.67 ± 0.54	0.52 ± 0.54
	D ₅₀ (Gy)	0.52 ± 0.40	0.54 ± 0.43	0.61 ± 0.47	0.64 ± 0.46	0.70 ± 0.47	0.69 ± 0.47	0.55 ± 0.42	0.46 ± 0.39
	HI	0.03 ± 0.03	0.04 ± 0.03	0.04 ± 0.03	0.04 ± 0.03	0.04 ± 0.03	0.04 ± 0.04	0.04 ± 0.04	0.03 ± 0.04
	CI	0.01 ± 0.01	0.01 ± 0.01	0.02 ± 0.01	0.02 ± 0.01	0.02 ± 0.01	0.02 ± 0.01	0.02 ± 0.01	0.01 ± 0.01
Time (s)	96	48	24	12	6	3	1.5	0.8	

Supplementary Table 4. Conv vs. sConv dose for diffusion models with DDIM step of 8 and cGAN model.

Model	cGAN [18]	DoseDiff [50]	cDDPM [7]	cwDDPM [12]
Prescription Isodose dice				
120%	0.89 ± 0.06	0.94 ± 0.03	0.94 ± 0.03	0.90 ± 0.06
100%	0.92 ± 0.04	0.95 ± 0.02	0.95 ± 0.02	0.94 ± 0.03
90%	0.93 ± 0.04	0.96 ± 0.02	0.96 ± 0.02	0.95 ± 0.03
50%	0.95 ± 0.03	0.97 ± 0.02	0.96 ± 0.02	0.96 ± 0.02
Metric diff				
D _{max} (Gy)	1.19 ± 1.12	0.47 ± 0.30	0.46 ± 0.32	1.00 ± 0.73
D _{mean} (Gy)	0.47 ± 0.62	0.39 ± 0.44	0.43 ± 0.40	0.73 ± 0.48
D _{min} (Gy)	0.87 ± 1.37	1.20 ± 0.97	1.27 ± 1.11	1.44 ± 1.20
V ₉₅ (%)	0.17 ± 1.18	0.75 ± 1.29	0.79 ± 1.34	0.39 ± 0.95
D ₉₅ (Gy)	0.38 ± 0.95	0.75 ± 0.71	0.81 ± 0.65	0.92 ± 0.56
D ₅₀ (Gy)	0.30 ± 0.47	0.31 ± 0.30	0.35 ± 0.30	0.69 ± 0.47
HI	0.01 ± 0.03	0.03 ± 0.02	0.03 ± 0.03	0.04 ± 0.04
CI	0.01 ± 0.04	0.02 ± 0.02	0.02 ± 0.02	0.02 ± 0.01

Supplementary Table 5. Tumor-to-skull distance dependent heterogeneity effect. DDIM step of 8 was used for diffusion models.

Parameters	Model	Tumor-to-skull distance	
		< 2 cm (n=8)	>= 2 cm (n=18)
Prescription isodose dice (%)	TMR10 dose	0.90 ± 0.02	0.92 ± 0.02
	cwDDPM (ours)	0.94 ± 0.02	0.96 ± 0.02
	DoseDiff	0.94 ± 0.02	0.96 ± 0.03
	DDPM	0.94 ± 0.02	0.96 ± 0.02
	cGAN	0.92 ± 0.02	0.93 ± 0.05

Supplementary Table 6. Tumor volume dependent heterogeneity effect. DDIM step of 8 was used for diffusion models.

Parameters	Model	Tumor volume	
		< 1cc (n=3)	>= 1 cc (n=23)
Prescription isodose dice (%)	TMR10 dose	0.89 ± 0.02	0.92 ± 0.02
	cwDDPM (ours)	0.91 ± 0.04	0.96 ± 0.02
	DoseDiff	0.92 ± 0.01	0.96 ± 0.02
	DDPM	0.92 ± 0.01	0.96 ± 0.02
	cGAN	0.85 ± 0.06	0.94 ± 0.02