Supplementary

Table S1 The Dosimetry Index of Oligoprogression Sites during Cyber Knife Radiosurgery Treatment

Item	CI	nCI	HI	Coverage (%)	Prescription dose (Gy)	PTV (cm^3)	BED10 (Gy)	Isodose (%)
Range	1.05-7.10	1.12-7.39	1.10-1.54	71.34-99.82	30-50	0.74-162.44	45-124.8	65-88
Mean	1.83	2.06	1.29	89	37.68	20.70	72.93	78
Median	1.34	1.67	1.29	92	37.5	10.34	65.7	79

Coverage: the volume of tumor receiving greater than or equal to prescription does divided by total volume of tumor times 100; CI: conformity index; HI: homogeneity index; PTV: planning target volume; BED10: biologically effective dose assuming tumor alpha/beta = 10 Gy.

Table S2 Details of each patient

Patient ID.	Sex	Age	ECOG	Smoking	Pathology	Stage	PD-L1 TPS	LIPI	EGFR	ALK	KRAS	TP53	Lines of CPI therapy before SBRT	Regimens of ICI therapy before SBRT	Olioprogressive lesions	Regimens after SBRT	Response of each lesion
1	Male	68	1	Always	Adenocarcinoma	IVb	35%	1	Mutant	Wild-type	Wild-type	Wild-type	1	Pembrolizumab+Docetaxel(4 cycle), and then followed by Pembroizumab	Lung	Pembrolizumab	CR
2	Male	70	2	Always	Adenocarcinoma	IVb	<1%	1	Mutant	Wild-type	Wild-type	Wild-type	1	Atezolizumab + nab-paclitaxel (4 cycle)+ Bevacizumab, and then followed by Atezolizumab + Bevacizumab	Liver	Atezolizumab+ Bevacizumab	PR
3	Male	63	2	Never	Adenocarcinoma	IVb	50%	0	Wild-type	Wild-type	Mutant	Mutant	1	Pembrolizumab+Bevacizumab	Brain, Brain	Pembrolizumab+Bevacizumab	CR, CR
4	Male	82	1	Former	Squamous	IVA	0	1	Unkown	Unkown	Unkown	Unkown	1	Pembrolizumab+nab-paclitaxel+carboplatin(4 cycle), and then followed by Pembroizumab	Lung, Brain	Pembrolizumab	PR, CR
5	Male	65	1	Always	Squamous	IIIB	0	2	Wild-type	Wild-type	Unkown	Unkown	1	Sintilimab+DP(6 cycle), and then followed by Sintilimab	Brain, Brain	Sintilimab+Anlotinib (Ajusted)	PR, PR
6	Male	67	0	Former	Adenocarcinoma	IVA	50%	0	Wild-type	Wild-type	Mutant	Wild-type	1	Pembrolizumab+AP(4 cycle), and then followed by Pembrolizumab+ Pemetrexed	LN	Pembrolizumab + Pemetrexed	CR
7	Female	52	1	Never	Squamous	IVb	0	0	Unkown	Unkown	Unkown	Unkown	2	Toripalimab+TP(4 cycyle), and then followed by Toripalimab	Lung	Toripalimab+Anlotinib (Ajusted)	PD
8	Male	48	2	Always	Adenocarcinoma	IVb	0	1	Wild-type	Wild-type	Wild-type	Mutant	2	Nivolumab+Anlotinib	Lung	Nivolumab+Anlotinib	SD
9	Male	76	1	Always	Adenocarcinoma	IVb	40%	0	Wild-type	Wild-type	Mutant	Mutant	2	Pembrolizumab+ Bevacizumab	Adrenal	Pembrolizumab+Bevacizumab	PR
10	Female	63	2	Never	Squamous	IVb	<1%	0	Wild-type	Wild-type	Mutant	Mutant	3	Pembrolizumab+Gemcitabine(4 cycle)+Bevacizumab	Adrenal	Pembrolizumab+Bevacizumab	PD
11	Male	54	2	Never	Adenocarcinoma	IVb	0	0	Wild-type	Wild-type	Unkown	Unkown	1	Toripalimab+ AP(4 cycle)， and then followed by Toripalimab	Brain	Toripalimab	PD
12	Female	48	1	Never	Squamous	IVb	0	1	Unkown	Unkown	Unkown	Unkown	1	Tislelizumab+TC(6 cycle)	Brain, Brain	Tislelizumab	PR, PR
13	Male	55	2	Never	Adenocarcinoma	IVb	10%	0	Mutant	Wild-type	Wild-type	Wild-type	1	Atezolizumab+Bevacizumab	Brain, Brain	Atezolizumab+Bevacizumab	PR, CR
14	Male	55	1	Never	Adenocarcinoma	IVb	45%	0	Wild-type	Wild-type	Wild-type	Wild-type	3	Nivolumab	Bone	Nivolumab+Bevacizumab (Ajusted)	CR
15	Female	37	1	Never	Adenocarcinoma	IVA	80%	0	Wild-type	Wild-type	Wild-type	Wild-type	2	Nivolumab	LN	Nivolumab	CR
16	Female	40	1	Never	Adenocarcinoma	IVA	35%	0	Wild-type	Wild-type	Wild-type	Wild-type	2	Nivolumab	Lung, LN	Nivolumab+Pemetrexed (Ajusted)	SD, CR
17	Female	51	2	Never	Squamous	IVb	0	2	Unkown	Unkown	Unkown	Unkown	3	Nivolumab	Brain, Brain	Nivolumab+Bevacizumab (Ajusted)	PR, CR
18	Male	46	1	Always	Adenocarcinoma	IIIB	Unknown	0	Wild-type	Wild-type	Wild-type	Wild-type	1	Pembrolizumab+AP(4 cycle)+ Bevacizumab, and then followed by Pembrolizumab+ Bevacizumab	Lung	Pembrolizumab+Bevacizumab	PR
19	Male	69	1	Always	Adenocarcinoma	IVA	10%	1	Wild-type	Wild-type	Wild-type	Unkown	1	Sintilimab+AP(4 cycle)+Anlotinib, and then followed by Sintilimab+Anlotinib	Lung	Sintilimab+Anlotinib	SD
20	Male	69	1	Always	Squamous	IVb	<1%	0	Wild-type	Wild-type	Wild-type	Mutant	1	Tislelizumab+DP(4 cycle),and then followed by Tislelizumab	LN, LN	Tislelizumab+nab-paclitaxel (Ajusted)	PR, PR
21	Female	52	1	Never	Adenocarcinoma	IVb	>1%	0	Wild-type	Wild-type	Wild-type	Wild-type	1	Sintilimab+AP(6 cycle),and then followed by Sintilimab	Brain, Brain	Sintilimab+Gemcitabine+Anlotinib (Ajusted)	PR, PR
22	Male	71	1	Always	Squamous	IIIB	2%	1	Wild-type	Wild-type	Unkown	Unkown	1	Sintilimab+DP(6 cycle),and then followed by Sintilimab	Lung	Sintilimab	PR
23	Male	78	1	Always	Adenocarcinoma	IVB	10%	0	Wild-type	Wild-type	Wild-type	Unkown	1	Pembrolizumab+AC(6 cycle), and then followed by Pembrolizumab	Lung, Adrenal	Pembrolizumab	PR, PR
24	Male	71	2	Always	Squamous	IIIB	>1%	1	Wild-type	Wild-type	Wild-type	Wild-type	1	Nivolumab combined Anlotinib	Lung	Nivolumab+Anlotinib	CR

ECOG: performance score of Eastern Cooperative Oncology Group; TPS: tumor proportion score; LIPI, the lung immune prognostic index; CPI, checkpoint inhibitor; SBRT: stereotactic body radiotherapy; LN: lymph node; CR: complete response; PR: partial response; SD: stable disease; PD: progression disease; AC/AP: Pemetrexed-cisplatin/carboplatin; TP/TC: Paclitaxel-cisplatin/carboplatin; DP: Docetaxel-carboplatin; Patient 1 and 13 had EGFR 20ins, Patient 2 had a SNV of p.D770E in exon 20. They tried immunotherapy as first line treatment and has no history of target therapy before immunothrerapy.

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Table S3 Univariable analysis of progression-free survival (PFS) and progression-free survival post oligoprogression (PFS-PO)

	PFS		PFS-PO	
	Hazard Ratio (95% CI)	P value	Hazard Ratio (95% CI)	P value
Age: ≥65	0.81 [0.35, 1.85]	0.614	2.91 [0.94, 9.03]	0.064
Gender: Male	0.62 [0.25, 1.53]	0.296	1.36 [0.46, 4.00]	0.572
Pathology: Squamous	2.47 [1.02, 5.99]	0.046	2.30 [0.86, 6.16]	0.099
Stage: IVA	1.18 [0.31, 4.52]	0.807	0.56 [0.08, 4.08]	0.563
Stage: IVB	1.21 [0.39, 3.73]	0.743	1.31 [0.28, 6.11]	0.729
ECOG: ≥2	1.93 [0.78, 4.76]	0.152	1.21 [0.44, 3.37]	0.711
Smoking: Always	0.67 [0.27, 1.64]	0.375	3.46 [1.00, 12.01]	0.051
Smoking: Former	0.64 [0.13, 3.04]	0.571	2.12 [0.24, 19.01]	0.501
LIPI: ≥1	2.53 [1.00, 6.42]	0.050	2.47 [0.90, 6.73]	0.078
PD-L1: Positive	0.49 [0.20, 1.17]	0.108	0.43 [0.16, 1.19]	0.104
EGFR: Mutant	1.74 [0.48, 6.31]	0.397	4.15 [1.06, 15.25]	0.041
KRAS: Mutant	0.32 [0.09, 1.16]	0.082	0.56 [0.12, 2.60]	0.457
TP53: Mutant	0.79 [0.24, 2.56]	0.696	1.75 [0.48, 6.34]	0.393
Lines of CPI therapy: ≥2	1.07 [0.43, 2.62]	0.89	1.36 [0.51, 3.67]	0.542
CPI Strategy: Mono	2.89 [0.92, 9.07]	0.068	0.87 [0.25, 3.10]	0.834
CPI Strategy-PO: Mono	-	-	1.13 [0.39, 3.27]	0.823
Strategy Modified	-	-	0.99 [0.34, 2.87]	0.979

ECOG, performance score of Eastern Cooperative Oncology Group; LIPI, the lung immune prognostic index; CPI, checkpoint inhibitor; CPI Strategy-PO, strategy of checkpoint inhibitor post oligoprogression.

Table S4 Univariable analysis of overall survival (OS) and overall survival post oligoprogression (OS-PO)

	OS		OS-PO	
	Hazard Ratio (95% CI)	P value	Hazard Ratio (95% CI)	P value
Age: ≥65	0.66 [0.13, 3.41]	0.619	1.57 [0.26, 9.61]	0.624
Gender: Male	0.56 [0.14, 2.32]	0.426	0.87 [0.21, 3.61]	0.843
Pathology: Squamous	7.57 [1.52, 37.81]	0.014	6.76 [1.36, 33.68]	0.02
Stage: IVA	0.52 [0.03, 8.47]	0.643	0.11 [0.00, 3.08]	0.196
Stage: IVB	1.28 [0.15, 10.95]	0.820	0.23 [0.01, 3.80]	0.306
ECOG: ≥2	2.04 [0.51, 8.21]	0.315	1.71 [0.43, 6.86]	0.450
Smoking: Always	0.70 [0.13, 3.82]	0.676	2.25 [0.33, 15.26]	0.405
Smoking: Former	1.70 [0.19, 15.39]	0.635	6.05 [0.43, 85.18]	0.182
LIPI: ≥1	4.88 [1.83, 43.16]	0.061	12.68 [1.44, 111.60]	0.022
PD-L1: Positive	0.08 [0.01, 0.68]	0.020	0.11 [0.01, 0.91]	0.041
EGFR: Mutant	2.00 [0.20, 19.57]	0.553	2.07 [0.20, 21.08]	0.539
KRAS: Mutant	1.27 [0.11, 14.12]	0.844	1.10 [0.10, 12.27]	0.936
TP53: Mutant	5.81 [0.52, 64.44]	0.152	4.03 [0.36, 44.95]	0.258
Lines of ICI therapy: ≥2	1.46 [0.35, 5.99]	0.601	0.90 [0.22, 3.76]	0.884
CPI Strategy: Mono	0.56 [0.07, 4.64]	0.593	0.37 [0.04, 3.08]	0.359
CPI Strategy-PO: Mono	-	-	0.52 [0.10, 2.73]	0.442
Strategy Modified	-	-	1.38 [0.33, 5.84]	0.663

ECOG, performance score of Eastern Cooperative Oncology Group; LIPI, the lung immune prognostic index; CPI, checkpoint inhibitor; CPI Strategy-PO, strategy of checkpoint inhibitor post oligoprogression.

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