

**Table S1** Univariable analysis to identify the confounding variables in OS

Characteristic	Surv.	P
Age (years)	–	<0.001
Sex		0.357
Male	87.52	
Female	90.55	
Histologic type		0.136
WHO type I/II	81.45	
WHO type III	88.78	
EBV DNA (1,000 copy/mL)		0.001
<1	92.95	
<10	83.68	
≥10	85.19	
T classification		<0.001
T1	95.61	
T2	87.82	
T3	90.43	
T4	77.93	
N classification		<0.001
N0	94.07	
N1	89.52	
N2	83.61	
N3	68.22	
Staging		<0.001
I	98.11	
II	94.41	
III	91.37	
IVa	76.86	
Treatment		0.203
RT	93.21	
CCRT	88.09	
IC + CCRT	87.24	
Volume	–	<0.001
MinR	–	0.002
ggfind_best		<0.001
MinR <0.0162	76.8	
MinR ≥0.0162	92.6	

Confounding variables: T/N classification, age, EBV selected as the confounding variables for all endpoints. Confounding variables were chosen for the subsequent multivariable analysis. P values were calculated using log-rank test. OS, overall survival; surv., 5-year survival rate; WHO, World Health Organization; EBV, Epstein-Barr virus; RT, radiotherapy; CCRT, concurrent chemoradiotherapy; IC, induction chemotherapy.

**Table S2** Multivariable analysis of OS in the model cohort

Variable	HR (CI)	P value
ggfind_best		
MinR <0.0162	1 (reference)	
MinR ≥0.0162	0.45 (0.27, 0.77)	0.004
T classification		
T1	1 (reference)	
T2	2.05 (0.81, 5.18)	0.131
T3	1.43 (0.63, 3.28)	0.395
T4	2.59 (1.08, 6.24)	0.034
N classification		
N0	1 (reference)	
N1	1.32 (0.65, 2.67)	0.435
N2	2.15 (0.94, 4.92)	0.070
N3	4.46 (1.88, 10.57)	0.001
Age (years)	1.03 (1.02, 1.05)	0.000
EBV DNA (1,000 copy/mL)		
<1	1 (reference)	
<10	1.53 (0.85, 2.74)	0.153
≥10	0.99 (0.55, 1.79)	0.976

MinR was proven to be an independent prognosis factor on OS. HR (CI) and P values were calculated by multivariable Cox regression. OS, overall survival; HR, hazard ratio; CI, confidence interval; EBV, Epstein-Barr virus.

**Table S3** Comparison of Harrell's C-index

Number	Cox regression equation	C-index (CI)	P1	P1
1	MinR	0.644 (0.591–0.697)	<0.001	ref.
2	Staging (I/II vs. III/IVa) <sup>#</sup>	0.609 (0.573–0.644)	<0.001	0.138
3	T classification (1/2 vs. 3/4) <sup>#</sup>	0.585 (0.540–0.631)	<0.001	<0.001
4	N classification (1/2 vs. 3/4) <sup>#</sup>	0.594 (0.543–0.646)	<0.001	0.005
5	T classification	0.670 (0.617–0.722)	<0.001	0.875
6	N classification	0.625 (0.569–0.682)	<0.001	0.064
7	Staging	0.688 (0.639–0.736)	<0.001	0.056
8	MinR model 1	0.756 (0.707–0.804)	ref.	<0.001
9	Clinical model 1	0.751 (0.704–0.799)	0.001	<0.001
10	MinR model 2	0.748 (0.699–0.796)	0.287	<0.001
11	Clinical model 2	0.741 (0.694–0.789)	0.025	<0.001

MinR alone showed the best ability to distinguish the prognosis of patients compared to AJCC staging or T/N classification. Clinical model 1/2: the most common clinical model of OS was built using multivariable Cox regression (<https://doi.org/10.1007/s00330-022-08864-7>) with variables of T and N classification (or staging) and EBV and age. MinR model 1 is MinR combined with the above variables; it significantly improved the C-index of clinical models, indicating a better discriminative ability. The P value of the 2 C-indices was calculated by the `rcorr.cens` function in the “Hmisc” package of R. <sup>#</sup>, in order to compare with MinR at the same level, we changed the staging and T/N classifications into early and late classifications according to clinical experience. C-index, concordance index; CI, confidence interval.