

Supplementary Figure 1 Primary CNS tumors occurred most commonly at the fourth ventricle (A). The statistical graphs showed the massive NM and the miliary metastases as the most frequent incidence in the intracranial (left) and intraspinal (right) groups respectively.

Supplementary Table 1 General characters of NM patients in different age courses

Supplementary Table 2 General features of NM patients with different primary tumors

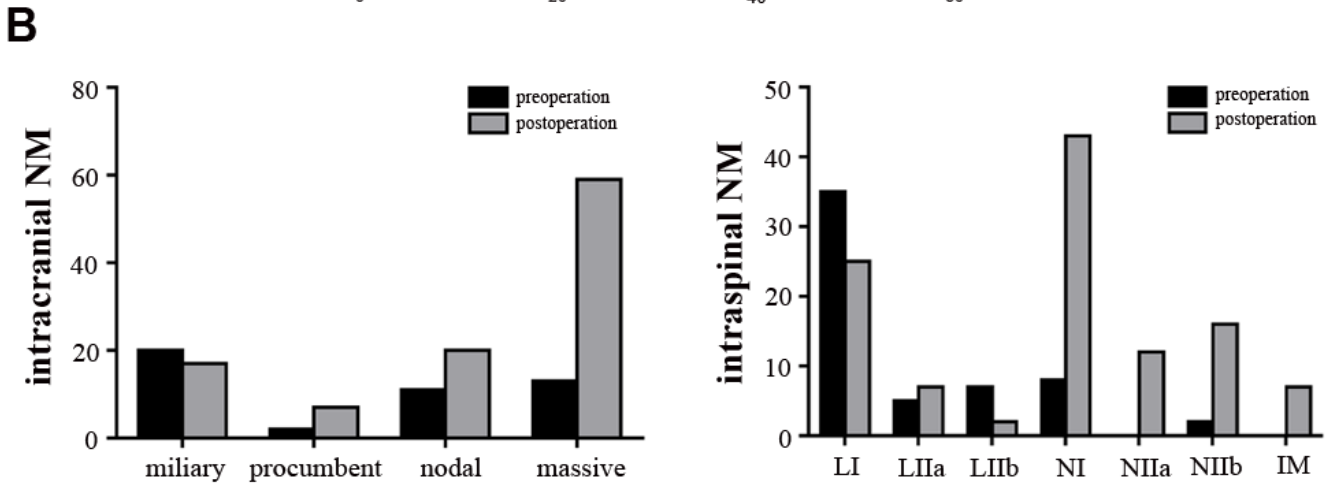
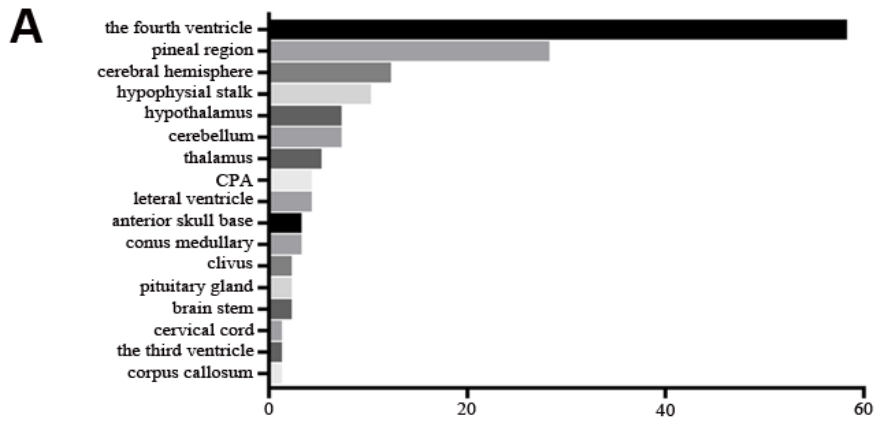
Supplementary Table 3 General features of patients with NM from low-grade gliomas and high-grade gliomas

Supplementary Table 4 Intraspinal NM classification

Supplementary Table 5 Chemo-/radiotherapy strategy for the NM patients

Supplementary Table 6 Univariate and multivariate Cox regression analyses of prognostic factors for the entire cohort

Supplementary Table 7 Comparison between < 12 m and > 12 m survivors



supplementary Figure 1

Table S1 General characters of NM patients in different age courses

	Children (< 14 y)	Young Adults (14 ~ 35 y)	Adult (≥ 35 y)	<i>p</i> value
Cases (N, %)	96 (48.48)	63 (31.82)	39 (19.70)	—
Gender (M : F)	1.82 : 1	2.15 : 1	2.00 : 1	—
Duration to NM (m)	8.9 (0 ~ 51)	21.1 (0 ~ 168)	35.7 (0 ~ 156)	< .001
Rates of coexisting NM	37.50%	34.92%	23.08%	< .05
The most common primary tumor	Medulloblastoma (54/96)	GCTs (23/63)	Glioma (14/39)	—
The most common NM site	Leptomeninges	The third ventricle	Lateral ventricle	—

Table S2 General features of NM patients with different primary tumors

	Medulloblastoma	GCTs	Glioma	Ependymoma	PPTs	<i>p</i> value
Cases (N, %)	68 (34.34)	38 (19.19)	35 (17.68)	15 (7.58)	10 (5.05)	—
Gender (M : F)	2.09 : 1	4.43 : 1	1.06 : 1	0.67 : 1	9:01	—
Age (median, range)	9.5, 2 ~ 59	17.5, 3 ~ 49	29, 3 ~ 62	12, 1 ~ 59	13, 3 ~ 58	< .01
Duration to NM (m)	19.6 (0 ~ 168)	8.9 (0 ~ 120)	17.6 (0 ~ 31)	21.2 (0 ~ 156)	19.7 (0 ~ 120)	< .001
Rates of coexisting NM	38.00%	40.74%	30.77%	38.46%	33.33%	0.207
The most common NM site	Leptomeninges	Lateral ventricle	Lateral ventricle	Leptomeninges	The fourth ventricle	—

Table S3 Characters of patients with low-grade and high-grade glioma

	Low-grade glioma	High-grade glioma
Cases (N, %)	11 (31.43)	24 (68.57)
Gender (M : F)	0.38 : 1	1.67 : 1
Age (median, range)	33.5, 6 ~ 62	20.0, 3 ~ 52
Duration to NM (m)	23.2 (3 ~ 29)	7.5 (0 ~ 31)
Rates of coexisting NM	27.27%	33.33%
The most common NM site	Lateral ventricle	Lateral ventricle

Table S4 Intraspinal NM classification

Type	Subtype	Neuroimaging features	No. (% , /169)
L	LI	Miliary shape	60 (35.50)
	LIIa	Procumbent pattern with extensive territory	12 (7.10)
	LIIb	Procumbent pattern with limited territory	9 (5.33)
N	NI	Nodular shape	51 (30.18)
	NIIa	Massive pattern with irregular boundary	12 (7.10)
	NIIb	Massive pattern with distinct boundary	18 (10.65)
IM	—	Intramedullary metastases	7 (4.14)

Table S5 Chemo-/radiotherapy strategy for the NM patients

	N (%)		N (%)
Chemotherapy		Radiotherapy	
<i>Medulloblastoma</i>		<i>Medulloblastoma</i>	
IFO + CBP + VM-26	30 (15.16)	CSI	37 (18.69)
ACNU + DDP + VCR	15 (7.58)	SRS	4 (2.02)
DDP + PEM	8 (4.04)	CSI + SRS	8 (4.04)
<i>GCTs</i>		WBRT	5 (2.53)
IFO + CBP + VP-16	21 (10.61)	<i>GCTs</i>	
DDP + BLM + VM-26	11 (5.56)	CSI	9 (4.55)
DDP + PEM	4 (2.02)	SRS	7 (3.54)
<i>Glioma</i>		CSI + SRS	8 (4.04)
TMZ + CPT-11 + Endostatin	17 (85.86)	WBRT	2 (1.01)
TMZ	10 (5.05)	<i>Glioma</i>	
TMZ + CBP + VM-26	3 (1.52)	CSI	1 (0.51)
TMZ + ACNU + VCR	2 (1.01)	SRS	7 (3.54)
TMZ + Apatinib	1 (0.51)	CSI + SRS	1 (0.51)
<i>Ependymal tumors</i>		WBRT	16 (8.08)
IFO + CBP + VP-16	6 (3.03)	<i>Ependymal tumors</i>	
TMZ + CBP + VM-26	2 (1.01)	CSI	2 (1.01)
<i>PPTs</i>		SRS	6 (3.03)
IFO + CBP + VP-16	6 (3.03)	WBRT	2 (1.01)
ACNU + DDP + VCR	4 (2.02)	<i>PPTs</i>	
<i>PNET</i>		CSI	1 (0.51)
IFO + CBP + VM-26	3 (1.52)	SRS	5 (2.53)
<i>PCNSL</i>		CSI + SRS	2 (1.01)
MTX + TMZ	4 (2.02)	WBRT	2 (1.01)
<i>Pituitary adenocarcinoma</i>		<i>PNET</i>	
Octreotide	1 (0.51)	CSI	1 (0.51)
		SRS	1 (0.51)
		WBRT	3 (1.52)

Table S6 Univariate and multivariate Cox regression analyses of prognostic factors for the entire cohort

Variables	Univariate		Multivariate	
	HR (95% CI)	<i>p</i> value	HR (95% CI)	<i>p</i> value
Gender (M / F)	0.83 (0.49-1.41)	0.49		
Age (< 15 y / ≥ 15 y)	0.98 (0.96-1.00)	0.04	0.75 (0.42-2.58)	0.01
Neurological presentation (Y / N)	1.05 (0.53-2.06)	0.89		
Coexisting NM (Y / N)	0.77 (0.68-1.86)	0.03	2.11 (1.06-3.23)	< 0.01
Interval to NM (< 1 y / ≥ 1 y)	2.68 (0.92-3.41)	< 0.01	1.85 (1.03-3.22)	< 0.01
Primary tumors				
Medulloblastoma	0.63 (0.27-1.48)	0.29		
GCTs	0.91 (0.36-2.15)	0.83		
Glioma	0.35 (0.11-1.08)	0.67		
Ependymal tumors	0.80 (0.26-2.50)	0.71		
PPTs	3.01 (0.94-10.11)	0.63		
others	0.83 (0.21-2.89)	0.88		
Metastatic sites				
Whole leptomeninges	0.56 (0.23-1.76)	0.03	0.88 (0.23-1.78)	0.36
Ventricular system	1.15 (0.52-3.03)	0.48		
Cerebrospinal parenchyma	2.21 (1.30-3.85)	0.75		
NM types				
Miliary	0.88 (0.48-1.64)	0.71		
Procumbent	1.18 (0.37-3.74)	0.77		
Nodal	0.60 (0.29-1.20)	0.01	0.52 (0.23-1.66)	0.03
Massive	0.96 (0.45-2.06)	0.92		
Treatment (OP / CT or RT)	1.03 (0.56-1.91)	0.93		

Table S7 Comparison between < 12 m and > 12 m survivors

	< 12 m survivors	> 12 m survivors	<i>p</i> value
Gender (M : F)	43 : 17 (2.53)	73 : 35 (2.09)	ns
Mean age at NM diagnosis, mean (SD)	21.7 (8)	18.6 (5)	< 0.01
Children : Adult	33 : 28 (1.18)	52 : 55 (0.95)	ns
Mean duration to NM diagnosis, mean (SD)	13.5 (4.1)	22.5 (3.7)	< 0.0001
Concurrent NM, N (%)	20 (32.79%)	35 (32.71%)	ns
Medulloblastoma, N (%)	23 (37.70%)	42 (39.25%)	ns
GCTs, N (%)	6 (9.84%)	23 (21.50%)	< 0.05
Glioma, N (%)	11 (18.03%)	17 (15.89%)	ns
Ependymoma, N (%)	5 (8.20%)	8 (7.48%)	ns
PPTs, N (%)	6 (9.84%)	4 (3.74%)	< 0.01
LM, N (%)	17 (27.87%)	60 (56.07%)	< 0.001
Ventricular system, N (%)	11 (18.03%)	25 (23.36%)	ns
Cerebrospinal parenchyma, N (%)	4 (6.56%)	18 (16.82%)	ns
OP alone: Comprehensive treatment (OP+CT+RT)	4 : 8 (0.5)	2 : 10 (0.2)	< 0.05