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Supplemental material

Identification of risk factors associated with leptomeningeal disease after resection of brain metastases

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DISCLAIMER The *Journal of Neurosurgery* acknowledges that the following section is published verbatim as submitted by the authors and did not go through either the *Journal's* peer-review or editing process.

Supplemental Table 1. Variables used for random forest models and number of missing data points for each variable

Variables
1) Age (N=0 missing)
2) Sex (Male/Female) (N=0 missing)
3) Minority Status (Minority/Non-minority) (N=1 missing)
4) Cancer Type (NSCLC/Melanoma/Breast/Gyn/RCC/Urothelial) (N=0 missing)
5) Location (Frontal/Parietal/Temporal/Occipital/Insula/Cerebellum) (N=0 missing)
6) Extracranial Disease Status (Present/Absent) (N=0 missing)
7) Tumor Side (N=0 missing)
8) Tumor Volume (N=3 missing)
9) Time from BM diagnosis to surgery (N=0 missing)
10) No. of BM resected at Surgery (N=0 missing)
11) No. of total BM at Surgery (N=0 missing)
12) Additional Craniotomies (Yes/No) (N=0 missing)
13) BM Hemorrhage (Yes/No) (N=1 missing)
14) Cystic Tumor (Yes/No) (N=4 missing)
15) Contact with Cortical Surface (Yes/No) (N=5 missing)
16) Contact with Ventricle (Yes/No) (N=5 missing)
17) Extent of Resection (GTR/STR) (N=1 missing)
18) Preop RT (Yes/No) (N=0 missing)
19) Postop RT Type (Focal RT/WBRT) (N=1 missing)
20) Postop WBRT Prior to LMD Diagnosis (Yes/No) (N=1 missing)
21) CPI Tx before Surgery (Yes/No) (N=0 missing)
22) CPI Tx after Surgery (Yes/No) (N=0 missing)
23) Other targeted tx before surgery (Yes/No) (N=0 missing)
24) Other targeted tx after surgery (Yes/No) (N=0 missing)
25) Any systemic therapy postop (Yes/No) (N=0 missing)

Supplemental Table 2. Univariate and multivariate nominal regression analyses examining factors associated with leptomeningeal disease

	Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	0.65 (0.16-2.66)	0.55		
Male (vs Female)	0.59 (0.29-1.19)	0.14		
Minority (vs White non-Hispanic)	2.05 (1.04-4.05)	0.038	1.66 (0.75-3.71)	0.21
Cancer Type (Breast/Gyn/Urothelial vs Other)	3.06 (1.57-5.96)	0.001	1.20 (0.52-2.76)	0.67
Tumor Side	1.30 (0.67-2.51)	0.44		
Location (Cerebellum/Insula/Occipital vs Other)	3.43 (1.76-6.69)	0.0003	4.54 (2.02-10.19)	0.0002
Absence of Extracranial disease	3.24 (1.65-6.34)	0.0006	4.17 (1.81-9.57)	0.0008
Tumor Volume	5.53 (0.82-37.36)	0.08	9.70 (0.94-99.66)	0.056
Time from BM diagnosis to surgery	1.20 (0.17-8.44)	0.86		
No. of total BM at Surgery	0.52 (0.07-3.62)	0.51		
No. of BM resected at Surgery (2 vs 1)	2.25 (0.52-9.78)	0.28		
Additional Craniotomies	1.48 (0.69-3.16)	0.31		
BM Hemorrhage	0.55 (0.28-1.08)	0.08	0.94 (0.42-2.08)	0.88
Cystic Tumor	1.07 (0.49-2.30)	0.87		
Contact with Cortical Surface	1.44 (0.70-2.94)	0.32		
Contact with Ventricle	2.63 (1.27-5.46)	0.01	2.21 (0.95-5.14)	0.067
GTR vs STR	0.95 (0.44-2.04)	0.89		
Prior Intracranial RT	1.18 (0.47-2.95)	0.73		
Immediate Postop Focal RT vs WBRT	1.41 (0.51-3.92)	0.51		
WBRT Prior to LMD Diagnosis	1.00 (0.45-2.20)	0.99		
CPI Tx before Surgery	0.84 (0.27-2.62)	0.76		
CPI Tx after Surgery	1.39 (0.62-3.10)	0.43		
Other targeted tx before surgery	1.43 (0.71-2.89)	0.32		
Other targeted tx after surgery	0.99 (0.52-1.91)	0.99		
Any systemic therapy postop	1.03 (0.50-2.12)	0.94		

BM: brain metastasis, CPI: checkpoint inhibitor, GTR: gross total resection, LMD: leptomeningeal disease, RT: radiotherapy, STR: subtotal resection, WBRT: whole brain radiotherapy

Supplemental Table 3. Nominal regression analysis examining factors associated with cLMD versus nLMD (N=47 patients)

	Univariate	
	cLMD vs nLMD	p-value
Age	1.17 (0.11-12.39)	0.90
M (vs F)	0.89 (0.24-3.31)	0.87
Minority (vs White non-Hispanic)	1.12 (0.34-3.68)	0.85
Cancer Type (Breast/Gyn/Urothelial vs Other)	0.96 (0.30-3.09)	0.95
Tumor Side (Right vs Left)	0.84 (0.25-2.83)	0.78
Location (Cerebellum/Insula/Occipital vs Other)	1.03 (0.32-3.35)	0.96
Absence of Extracranial disease	0.95 (0.28-3.20)	0.94
Tumor Volume	1.08 (0.07-15.81)	0.95
Time from BM diagnosis to surgery	1.56 (0.17-14.33)	0.69
No. of total BM at Surgery	2.94 (0.21-41.19)	0.42
No. of BM resected at Surgery (2 vs 1)	0.72 (0.06-8.58)	0.80
Additional Craniotomies	1.07 (0.28-4.06)	0.92
BM Hemorrhage	2.18 (0.63-7.61)	0.22
Cystic Tumor	1.25 (0.32-4.90)	0.75
Contact with Cortical Surface	3.14 (0.73-13.5)	0.12
Contact with Ventricle	0.78 (0.23-2.72)	0.70
GTR vs STR	1.25 (0.31-5.05)	0.75
Preop RT	2.22 (0.44-11.32)	0.34
Immediate Postop Focal RT vs WBRT	0.43 (0.06-2.84)	0.38
WBRT Prior to LMD Diagnosis	1.57 (0.38-6.43)	0.53
CPI Tx before Surgery	1.53 (0.20-11.92)	0.69
CPI Tx after Surgery	2.14 (0.49-9.33)	0.31
Other targeted tx before surgery	2.18 (0.63-7.61)	0.22
Other targeted tx after surgery	2.48 (0.75-8.17)	0.14
Any systemic therapy postop	13.5 (1.58-115.70)	0.02