

**Supplemental Table 1:** Clinical and imaging characteristics of patients with newly diagnosed cerebral lesions

Patient ID	Diagnosis	WHO grade	Confirmation of diagnosis	Presence of tumor	CE on MRI	TBR <sub>max</sub>	TBR <sub>mean</sub>	TTP (min)	Kinetic pattern
1 <sup>+</sup>	A	II	B	Yes	Yes	1.7	1.2	40	1
2	Hyperintense MRI lesion (supratentorial)	n.a.	Clinically and follow-up MRI*	No	No	1.5	1.2	45	1
3	AA	III	B	Yes	No	3.8	2.3	25	2
4	A	II	B	Yes	Yes	3.5	2.4	25	2
6	DNT	I	R	Yes	Yes	2.4	1.9	20	2
7	Multiple Sclerosis	n.a.	B	No	Yes	1.9	1.7	45	1
8	Hyperintense MRI lesion (pons)	n.a.	Follow-up**	Yes	No	1.0	0.9	13	3
9	Stroke	n.a.	Clinically and follow-up MRI	No	Yes	1.7	1.5	40	1
10	AA	III	B	Yes	No	1.7	1.6	8	3
11	A	I	B	Yes	n.a.	2.4	1.7	45	1
12	LGG	not classifiable	B	Yes	No	1.3	1.0	45	1
13 <sup>+</sup>	A	II	B	Yes	No	1.7	1.5	20	2
14	LGG	not classifiable	B	Yes	No	1.7	1.5	45	1
16 <sup>+</sup>	GBM	IV	R	Yes	n.a.	4.6	2.6	20	3
18	AA	III	B	Yes	No	1.2	1.0	8	3
19 <sup>+</sup>	GBM	IV	B	Yes	n.a.	3.0	2.0	25	2
21	AVM	n.a.	MR imaging findings	No	No	1.5	1.2	20	2
22	GBM	IV	R	Yes	Yes	3.1	1.9	45	1
27	Hyperintense MRI lesion (supratentorial)	n.a.	Follow-up***	No	No	1.0	0.8	30	1
28 <sup>+</sup>	GBM	IV	R	Yes	No	2.9	2.1	20	2
34	AA	III	B	Yes	Yes	2.3	1.9	25	2
38	Hyperintense MRI lesion (supratentorial)	n.a.	Follow-up****	No	No	1.6	1.2	17	2
43	A	II	R	Yes	No	2.1	1.8	25	2
44	A	I	R	Yes	Yes	2.1	1.8	40	1
47	Rathke's cyst	n.a.	B	No	No	0.6	0.3	not evaluable	not evaluable
48	LGG	not classifiable	B	Yes	No	1.2	0.9	not evaluable	not evaluable

**A:** astrocytoma; **AA:** anaplastic astrocytoma; **DNT:** dysembryoplastic neuroepithelial tumor; **LGG:** low-grade glioma; **GBM:** glioblastoma; **AVM:** arteriovenous malformation; **CE:** contrast enhancement; **B:** biopsy; **R:** resection; **TTP:** time-to-peak; **n.a.:** not available; \*lesion disappeared in the follow-up MRI after 3 months; \*\*patient died 9 months later; \*\*\*stable after 12 months without treatment; \*\*\*\*stable after 16 months without treatment; <sup>+</sup>patients were additionally examined for other indications

**Supplemental Table 2:** Clinical and imaging characteristics of patients with suspicion of tumor progression/recurrence

Patient ID	Initial Diagnosis	WHO Grade	Presence of PD	Confirmation of diagnosis (PD / no PD)	Treatment of PD	Follow-up after <sup>18</sup> F-FET PET (months)	CE on MRI	TBR <sub>max</sub>	TBR <sub>mean</sub>	TTP (min)	Kinetic pattern
1 <sup>+</sup>	AA*	III	Yes	B and clinically, died 11 mo later	symptomatic treatment	11	No	4.4	2.4	30	2
5	Ependymoma	III	Yes	clinically	RTx	24	Yes	2.8	1.9	25	2
13 <sup>+</sup>	A	II	Yes	clinically, died 14 mo later	symptomatic treatment	14	No	2.9	2.0	10	3
15	GBM	IV	Yes	clinically, died 1 mo later	palliative care	1	Yes	4.4	2.8	13	3
16 <sup>+</sup>	GBM	IV	Yes	clinically	Cilengitide, after 4 mo palliative care	25	Yes	2.6	2.0	30	2
17	GBM	IV	No	clinically, stable follow-up over 22 mo	no treatment	22	No	1.3	1.0	45	1
			No				1.2	0.9	45	1	
			No				1.4	0.9	40	1	
20	GBM	IV	Yes	B	RTx, TMZ	2	n.a.	1.1	0.8	45	1
			Yes	clinically, died 18 mo later	trofosfamide + etoposide	18	Yes	1.8	1.7	20	2
23	A	II	No	B	no treatment	8	No	1.1	0.9	40	1
24	A	I	No	clinically, stable follow-up over 12 mo	no treatment	12	Yes	0.7	0.6	40	1
25	A	I	No	clinically	no treatment	3	Yes	1.9	1.7	40	1
			No	clinically, stable follow-up for 12 mo	no treatment	12	n.a.	2.1	1.8	40	1
26	GBM	IV	Yes	clinically	Cilengitide	8	n.a.	3.8	2.4	25	2
30	Ependymoma	II	No	clinically, stable follow-up for 14 mo	no treatment	14	Yes	1.6	1.4	40	1
32	Ependymoma	III	No	clinically, stable follow-up for 11 mo	no treatment	11	Yes	1.0	1.0	n.a.	n.a.
33 <sup>+</sup>	PXA	II	Yes	R	R	n.a.	Yes	1.7	1.7	23	2
40	MM metastasis	n.a.	Yes	clinically, patient died 1 mo later	palliative care	1	Yes	2.1	1.8	n.a.	n.a.

41	OA	III	No	clinically	continuation of CTx	3	Yes	3.5	2.1	40	1
			Yes	clinically	BEV/IRI, died 2 mo later	2	Yes	4.9	2.6	40	1
42 <sup>+</sup>	Medulloblastoma	IV	No	clinically	continuation of CTx	2	Yes	2.8	2.1	5	3
45	ODG	II	Yes	clinically	symptomatic treatment	12	No	1.8	1.7	23	2
			Yes	R	R	n.a.	No	1.8	1.7	30	1

**A:** astrocytoma; **AA\*:** secondary anaplastic astrocytoma after malignant progression; **PXA:** pleomorphic xanthoastrocytoma; **GBM:** glioblastoma; **MM:** malignant melanoma; **OA:** oligoastrocytoma; **ODG:** oligodendroglioma; **PD:** progressive disease/tumor recurrence; **CE:** contrast enhancement; **RTx:** radiation therapy; **CTx:** Chemotherapy; **BEV/IRI:** bevacizumab in combination with irinotecan; **TMZ:** temozolomide 5/28; **B:** biopsy; **R:** resection; **TTP:** time-to-peak; **n.a.:** not available / patient lost of follow-up; <sup>+</sup>patients were additionally examined for other indications

**Supplemental Table 3:** Use of <sup>18</sup>F-FET PET for monitoring of chemotherapy effects

Patient ID	Diagnosis	WHO Grade	Treatment	Timing of <sup>18</sup> F-FET PET	CE on MRI	TBR <sub>max</sub>	TBR <sub>mean</sub>	TTP (min)	Kinetic pattern	<sup>18</sup> F-FET PET treatment effects compared to baseline		
										Decrease of TBR <sub>max</sub>	Decrease of TBR <sub>mean</sub>	Change of kinetic parameter
16 <sup>+</sup>	GBM	IV	TMZ	baseline	Yes	2.4	1.9	40	1			
				after 3 <sup>rd</sup> cycle	n.a.	2.5	1.9	17	3	+4%	0%	yes
				after 6 <sup>th</sup> cycle	n.a.	1.9	1.7	30	2	21%	10%	yes
19 <sup>+</sup>	GBM	IV	TMZ	baseline*	Yes	3.0	2.0	25	2			
				after 12 <sup>th</sup> cycle	Yes	2.0	1.7	40	1	33%	15%	yes
36 <sup>+</sup>	Ewing's sarcoma	IV	Carboplatin + Topotecan	baseline	Yes	3.1	2.3	13	3			
				4 mo after baseline	Yes	1.9	1.8	30	1	39%	22%	yes
				8 mo after baseline	Yes	2.1	1.8	40	1	32%	22%	yes
42 <sup>+</sup>	Medulloblastoma	IV	Carboplatin + Etoposid	baseline**	Yes	2.8	2.1	5	3			
				2 mo after baseline	Yes	1.7	1.6	40	1	39%	24%	yes

**GBM:** glioblastoma; **CE:** contrast enhancement; **RTx:** radiation therapy; **CTx:** Chemotherapy; **BEV:** bevacizumab; **TMZ:** Temozolomide 5/28; **TTP:** time-to-peak; \*baseline PET was performed at initial diagnosis (s. Table 1); \*\*baseline PET was performed at recurrence (s. Table 2); <sup>+</sup>patients were additionally examined for other indications

**Supplemental Table 4:** Use of  $^{18}\text{F}$ -FET PET for the detection of residual tumor tissue after resection

Patient ID	Diagnosis	WHO Grade	Time between tumor resection and $^{18}\text{F}$ -FET PET (d)	CE on early postoperative MRI	Extent of resection	TBR <sub>max</sub>	TBR <sub>mean</sub>	TTP (min)	Kinetic pattern	Residual tumor on $^{18}\text{F}$ -FET PET
16 <sup>+</sup>	GBM	IV	8	n.a.	n.a.	3.9	2.4	25	2	Yes
28 <sup>+</sup>	GBM	IV	14	Yes	PR	3.2	2.1	n.a.	n.a.	Yes
29	Ependymoma	II	7	Yes	PR	3.3	2.2	10	3	Yes
			36	Yes	PR	2.6	2.0	33	1	Yes
31	A	I	2	Yes	PR	3.5	2.5	40	1	Yes
33 <sup>+</sup>	PXA	II	7	Yes	PR	2.1	1.8	40	1	Yes
35	Medulloblastoma	IV	7	No	CR	1.7	1.6	33	1	No
36 <sup>+</sup>	Ewing's sarcoma	IV	7	Yes	PR	3.6	2.5	20	2	Yes
37	OA	III	14	Yes	PR	2.4	2.0	20	2	Yes
39	GBM	IV	7	No	PR*	2.9	2.1	n.a.	n.a.	Yes
46	GBM	IV	20	Yes	PR	2.1	1.8	n.a.	n.a.	Yes

**A:** astrocytoma; **AA:** anaplastic astrocytoma; **PXA:** pleomorphic xanthoastrocytoma; **GBM:** glioblastoma; **OA:** oligoastrocytoma; **CE:** contrast enhancement on early postoperative MRI within the first 48 h after resection; **CR:** complete resection; **PR:** partial resection; **TTP:** time-to-peak; **n.a.:** not available; <sup>+</sup>patients were additionally examined for other indications; \*presence of non-enhancing residual tumor

**Supplemental Table 5:** Results of the diagnostic performance of PET parameter

<b>Identification of neoplastic tissue in newly diagnosed brain lesions</b>	<b>TBR<sub>max</sub></b>	<b>TBR<sub>mean</sub></b>	<b><sup>18</sup>F-FET kinetic pattern</b>	<b>Combination of TBR<sub>max</sub> and <sup>18</sup>F-FET kinetic pattern</b>
<i>Threshold</i>	1.7	1.4	≥ 2	*
<i>Sensitivity</i>	79%	74%	67%	95%
<i>Specificity</i>	72%	71%	67%	50%
<i>Accuracy</i>	77%	73%	67%	88%
<i>PPV</i>	88%	88%	86%	90%
<i>NPV</i>	56%	50%	40%	67%
<i>AUC ± standard error</i>	0.80 ± 0.09	0.79 ± 0.09	-	-
<i>P-value</i>	0.021	0.026	0.192** (n.s.)	0.061** (n.s.)
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<b>Identification of tumor progression/recurrence</b>	<b>TBR<sub>max</sub></b>	<b>TBR<sub>mean</sub></b>	<b><sup>18</sup>F-FET kinetic pattern</b>	<b>Combination of TBR<sub>max</sub> and <sup>18</sup>F-FET kinetic pattern</b>
<i>Threshold</i>	1.7	1.6	≥ 2	*
<i>Sensitivity</i>	92%	92%	75%	92%
<i>Specificity</i>	64%	64%	90%	60%
<i>Accuracy</i>	79%	79%	82%	77%
<i>PPV</i>	75%	75%	90%	73%
<i>NPV</i>	88%	88%	75%	86%
<i>AUC ± standard error</i>	0.78 ± 0.10	0.77 ± 0.10	-	-
<i>P-value</i>	0.020	0.024	0.004**	0.020**

\* presence of TBR<sub>max</sub> of ≥ 1.7 or kinetic pattern 2 or 3

\*\* Fisher exact test

AUC = area under the curve

PPV = positive predictive value

NPV = negative predictive value

n.s. = not significant