ON-LINE APPENDIX

MATERIALS AND METHODS

Image Acquisition

MR imaging of all patients was performed using 1 of two 3T MR imaging scanners (Magnetom Verio or Magnetom Skyra; Siemens, Erlangen, Germany) with a 32-channel head coil. The MR imaging protocol included pre- and postcontrast 3D-MPRAGE sequences with multiplanar reconstructions for T1WI in the axial, coronal, and sagittal planes; an axial T2 FLAIR sequence; and an axial T2WI with turbo spin-echo sequences. The specific parameters for the sequences were as follows: 1) for 3D-MPRAGE: TR, 1370–1600 ms; TE, 1.9–2.8 ms; flip angle, 9°; matrix, 256 × 232; FOV, 250 × 250; section thickness, 1 mm; and NEX, 1; 2) for the axial T2 FLAIR sequence: TR, 8000–9000 ms; TE, 90–97 ms; TI, 2300–2500 ms; flip angle, 130°–150°; matrix, 384 × 209–278; FOV, 199 × 220; section thickness, 5 mm; and NEX, 1–2; and 3) for the axial T2WI sequence: TR, 5100 ms; TE, 89 ms; flip angle, 150°; matrix, 640 × 348; FOV, 199 × 220; section thickness, 5 mm; and NEX, 3.

For the DCE-MR imaging, 3D gradient-echo T1WI was acquired. Forty images were obtained at intervals equal to the TR for each section. The specific imaging parameters were as follows: TR, 2.8 ms; TE, 1.0 ms; flip angle, 10°; matrix, 192 × 192; FOV, 240 × 240 mm; section thickness, 3 mm; voxel size, 1.25 × 1.25 × 3 mm^3; and total acquisition time, 5 minutes 8 seconds.

Afterwards, the DSC-MR imaging was performed with a single-shot, gradient-echo, echo-planar imaging sequence. Sixty images were obtained at intervals equal to the TR for each section. The imaging parameters of the DSC-MR imaging were as follows: TR, 1600 ms; TE, 30 ms; flip angle, 90°; matrix, 128 × 128; FOV, 240 × 240 mm; section thickness, 6 mm; intersection gap, 6.9 mm; voxel size, 1.86 × 1.86 × 5 mm; and total acquisition time, 1 minute 36 seconds.

The DCE-MR imaging was performed after intravenous administration of gadobutrol (Gadovist; Bayer Schering Pharma, Berlin, Germany; at a dose of 0.1 mmol/kg of body weight), followed by a 30-mL saline bolus at a rate of 4 mL/s using a power injector (Spectris; MedRad, Indianola, Pennsylvania). Then, the DSC-MR imaging was acquired after an intravenous injection of the same contrast agent using the same dose and method.

RESULTS

Correlation Analysis

The Pearson correlation analysis was performed and the intraclass correlation coefficients were calculated to evaluate whether the EF from DSC-MR imaging was correlated with contrast leakage information from DCE-MR imaging, including the K^{trans}, Ve, and Vp. The Pearson correlation analysis showed a weak correlation only between the mean EF and Vp values, whereas no significant correlation was found for the other cases. The correlation coefficient *r* and *P* value of each case are shown in On-line Fig 3. For the intraclass correlation coefficients, no significant agreement was found between the EF and the K^{trans}, Ve, and Vp. The intraclass correlation coefficient values and 95% CIs are shown in On-line Table 1.

On-line Table 1: Intraclass correlation coefficients between the EF from DSC-MR imaging and the K^{trans}, Ve, and Vp from DCE-MR imaging

Lesion/Parameters	ICC[a]	95% CI	Agreement
Enhancing area on contrast-enhanced T1WI			
EF mean vs K^{trans} mean	–0.032	–0.225–0.162	Negative
EF mean vs Ve mean	–0.002	–0.195–0.192	Negative
EF mean vs Vp mean	–0.105	–0.293–0.090	Negative
Nonenhancing FLAIR high-signal-intensity area			
EF mean vs K^{trans} mean	–0.001	–0.195–0.193	Negative
EF mean vs Ve mean	0.018	–0.177–0.211	Positive but poor
EF mean vs Vp mean	–0.196	–0.376 to –0.003	Negative
EF 95th PV vs K^{trans} 95th PV	–0.001	–0.195–0.192	Negative
EF 95th PV vs Ve 95th PV	0.015	–0.180–0.208	Positive but poor
EF 95th PV vs Vp 95th PV	–0.166	–0.349–0.029	Negative

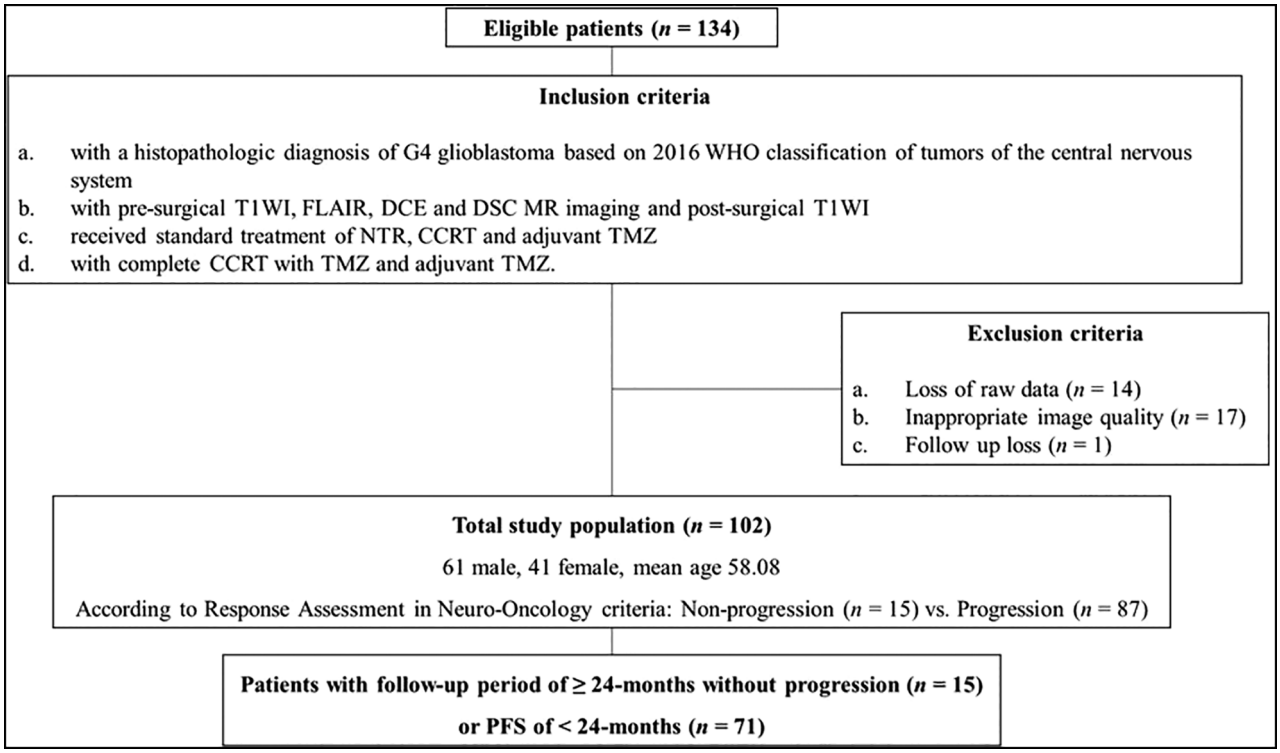
Note:—ICC indicates intraclass correlation coefficient; PV, percentile value.

[a] ICC values are <0 (negative), 0–0.20 (positive but poor), 0.21–0.40 (fair), 0.41–0.60 (moderate), 0.61–0.80 (good), or >0.81 (excellent).

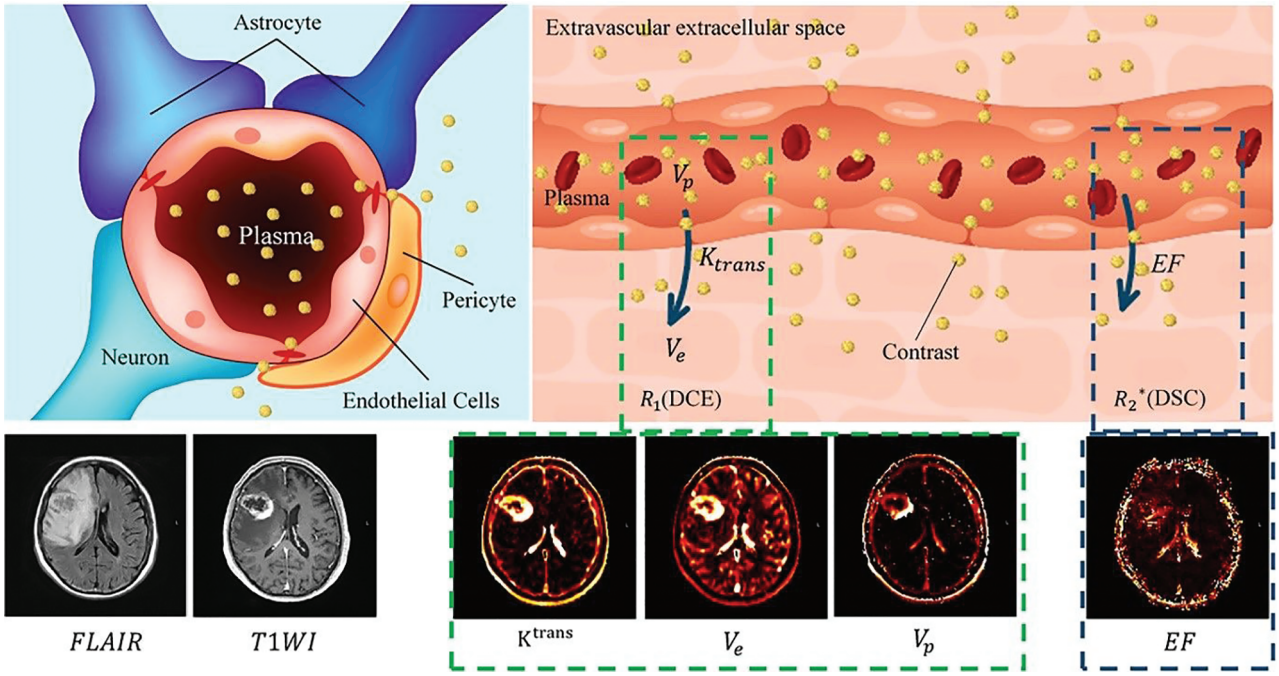
On-line Table 2: Cox proportional hazards regression[a]

	EF 95th PV	*IDH1/2*	*MGMT*	Age
P value[b]	.01	.30	.12	.36

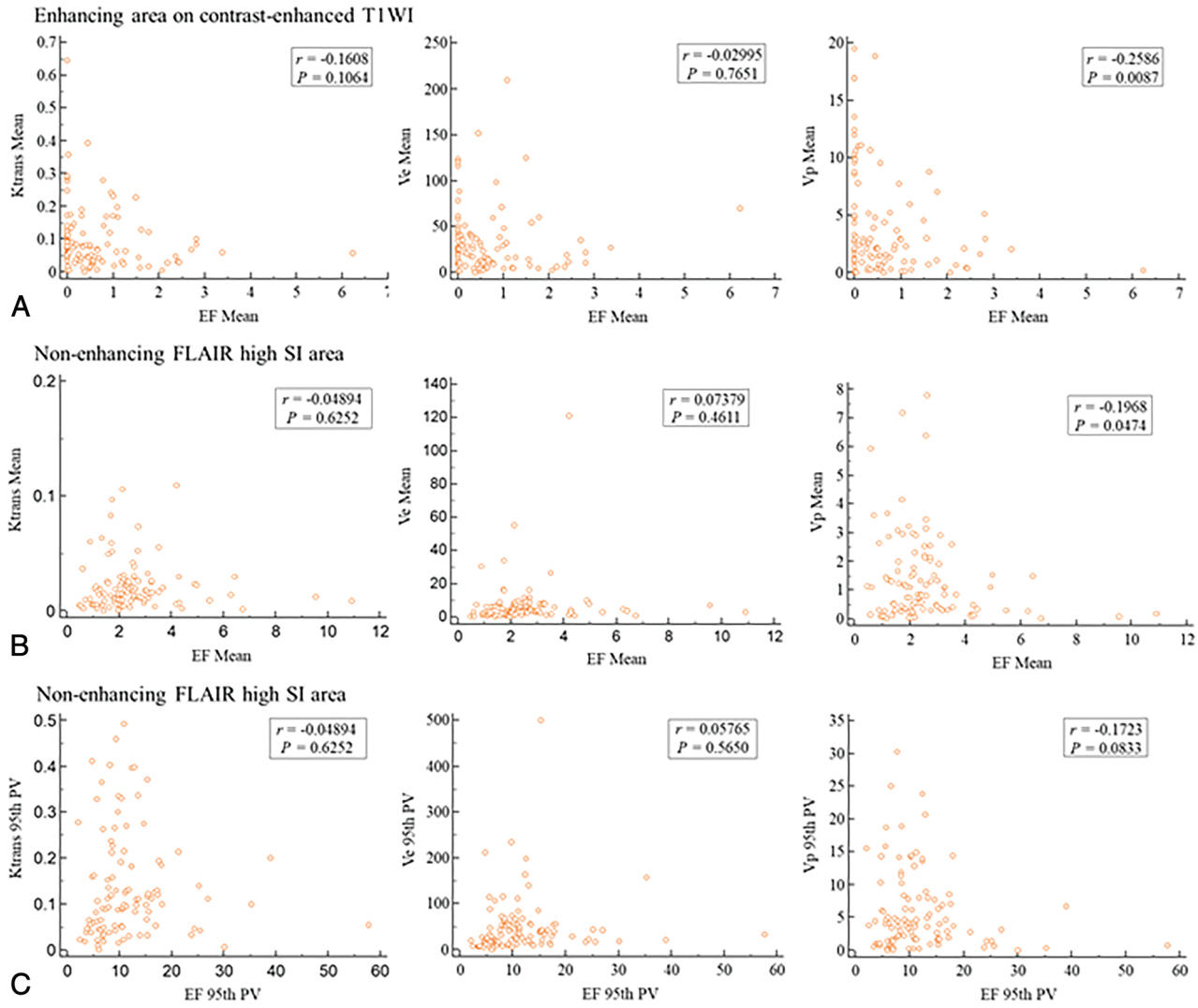
Note:—PV indicates percentile value.
[a] The study population ($n = 102$) was analyzed.
[b] Calculated with Cox proportional hazards model analysis.



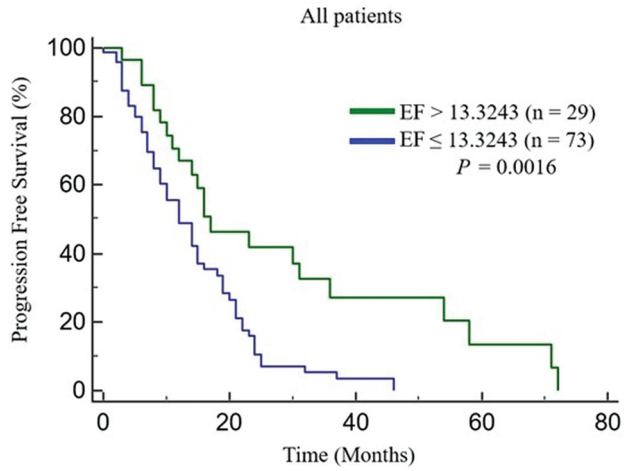
ON-LINE FIG 1. Study design flow chart.



ON-LINE FIG 2. Schematic diagram of the contrast leakage information based on DCE- and DSC-MR imaging. DSC-MR imaging uses T2* shortening effects, whereas DCE-MR imaging uses T1 shortening effects. EF is a parameter from DSC-MR imaging, and K^{trans}, Ve, and Vp are parameters from DCE-MR imaging for contrast leakage information.



ON-LINE FIG 3. The Pearson correlation analysis between the EF from DSC-MR imaging and K^{trans}, Ve, and Vp from DCE-MR imaging. The Pearson correlation analysis between the mean EF value and the K^{trans}, Ve, and Vp based on T1 enhancing lesions (*A*). The Pearson correlation analysis between the mean value (*B*) or 95th percentile value (*C*) of EF and the K^{trans}, Ve, and Vp based on nonenhancing FLAIR high-signal-intensity lesions. Except for a weak correlation between the mean EF and Vp values, there were no significant results.



ON-LINE FIG 4. Kaplan-Meier survival analysis according to the EF value. The high EF 95th percentile value patient group showed significantly longer PFS than the low EF 95th percentile value patient group. The median survival of the high and low EF 95th percentile value patient groups was 17.0 months (95% CI, 12.0–36.0 months) versus 12.0 months (95% CI, 9.0–15.0 months), respectively ($P = .02$).