

Multispot white matter hyperintensity pattern for predicting amyloid positivity in memory clinic

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Background

- The multispot white matter hyperintensities (WMH) pattern is a well-recognized imaging marker of cerebral amyloid angiopathy (CAA).
- However, its prevalence and potential role in predicting amyloid positivity in early dementia patients are not fully elucidated and is a key of our interest.

Methods

- We conducted a cross-sectional study of cognitively impaired patients from a memory clinic.
- All participants received cognitive functions test and a 3.0 T brain MRI and amyloid PET scan as our imaging protocol, as shown in Fig 1.
- Different WMH patterns and scores, including anterior and posterior periventricular WMH patterns, multispot subcortical WMH patterns, and Fazekas scores, were compared between amyloid-positive and amyloid-negative groups (Fig. 2).
- Multivariable logistic regression was performed to evaluate associations with amyloid positivity and multispot white matter hypertensitiy pattern. ROC and AUC analyses were used to assess model performance.

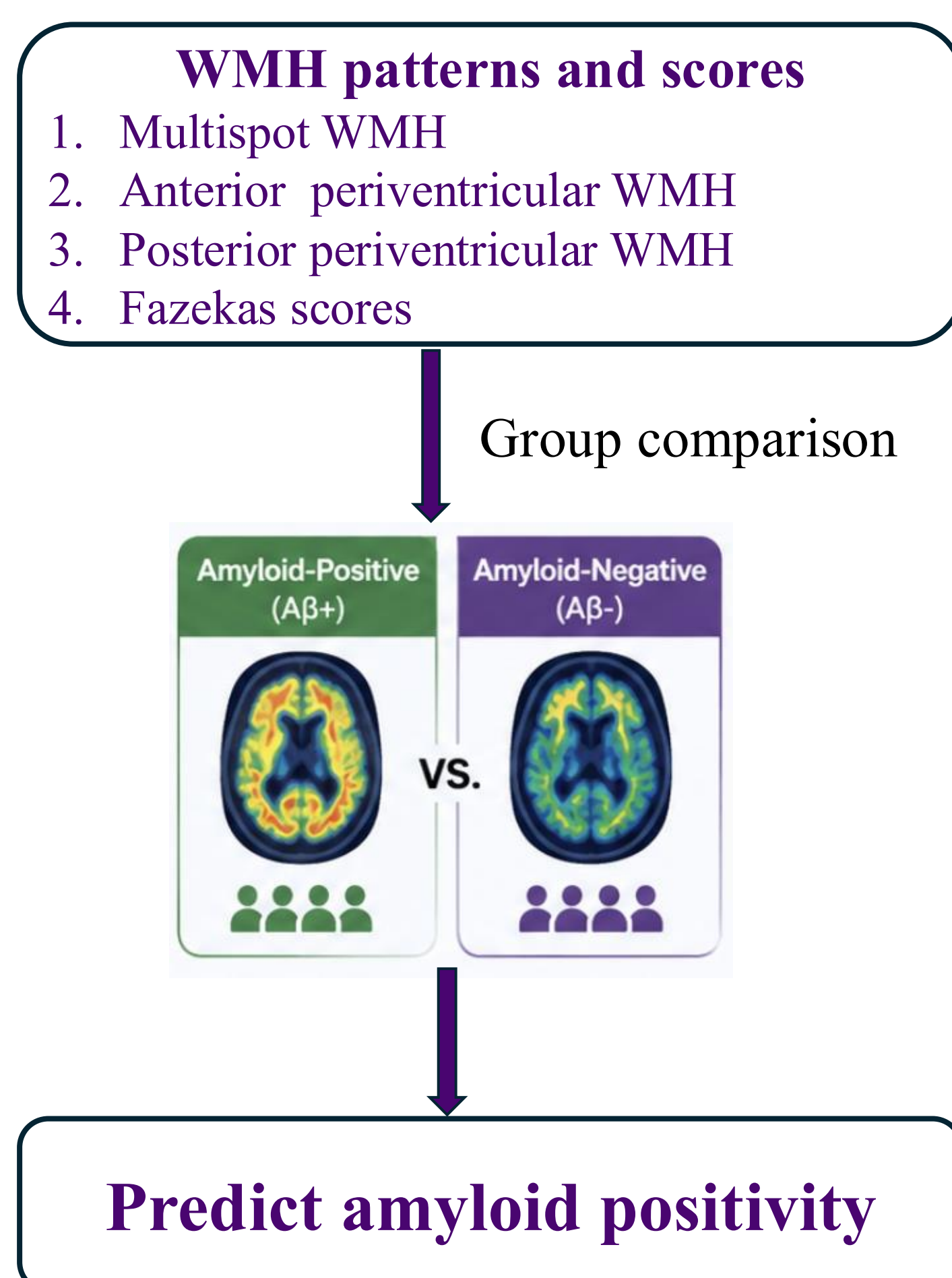


Figure.1. Study algorithmn

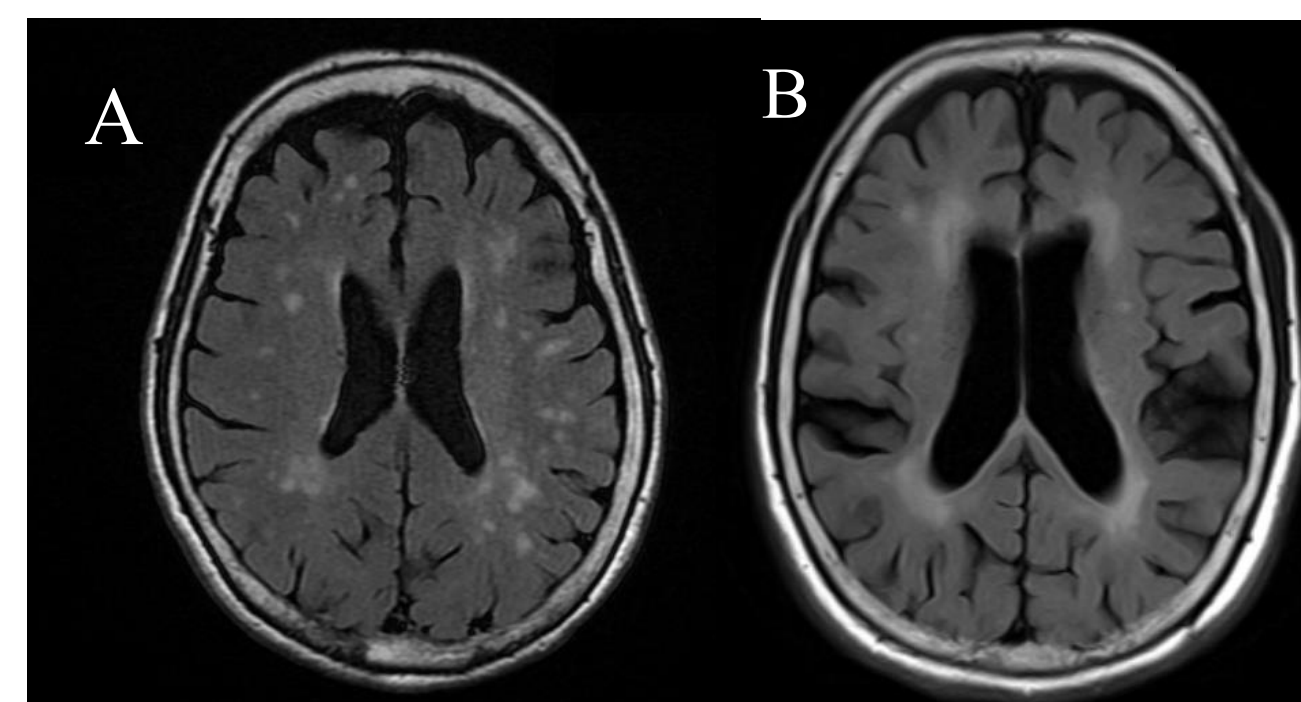


Figure 2. A. Multispot white matter hyperintensities pattern according to Boston criteria 2.0 for CAA. B. Anterior and posterior periventricular white matter hyperintensities patterns

Table.1 Baseline demographic data according to amyloid status

Characteristic	Amyloid Negative N = 62	Amyloid Positive N = 98	p-value ¹
Age	76.89 (7.30)	74.90 (6.61)	0.017
Gender, Female, n (%)	33 (53%)	64 (65%)	0.13
APOE4 carrier, n (%)	4 (7.0%)	50 (53%)	<0.001
MMSE, mean (SD)	22.94 (4.59)	20.33 (5.42)	0.002
CDR, n (%)			0.2
0.5	54 (87%)	74 (76%)	
1	8 (13%)	22 (22%)	
2	0 (0%)	2 (2.0%)	
Education, mean (SD)	10.70 (4.39)	10.88 (4.74)	0.7
Hypertension, n (%)	42 (68%)	60 (63%)	0.5
DM, n (%)	26 (42 %)	26 (27%)	0.052
Dyslipidemia, n (%)	35 (56%)	63 (66%)	0.2
Smoking, n (%)	10 (16%)	5 (5.2%)	0.022
Centiloid, mean (SD)	-5.07 (10.75)	66.80 (31.14)	<0.001
Total microbleed counts, mean (SD)	0.95 (1.93)	1.94 (6.83)	>0.9
T1 weighted white matter hypointensity volume, mean (SD)	4,895.23 (4,118.16)	4,642.23 (4,069.40)	0.9

1. Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's exact test

Table.2 Comparison of imaging data according to amyloid status

Characteristic	Amyloid Negative N = 62	Amyloid Positive N = 98	p-value ¹
Multispot_WMh	11 (18%)	62 (63%)	<0.001
Anterior_Periventricular	25 (40%)	36 (37%)	0.6
Posterior_Periventriculr	27 (44%)	35 (36%)	0.3
Peribasal_ganglia_WMh	5 (8.1%)	7 (7.1%)	>0.9
Fazekas_periventricular, 0	4 (6.9%)	3 (3.2%)	0.7
1	30 (52%)	50 (53%)	
2	24 (41%)	41 (44%)	
3	4 (6.3%)	4 (4.1%)	
Fazekas_deep, 0	11 (18%)	13 (14%)	0.4
1	27 (45%)	37 (39%)	
2	22 (37%)	45 (47%)	
3	2 (3.2 %)	3 (3.1 %)	
T1_WM_hypointensity volume, mean (SD)	4,895.23 (4,118.16)	4,642.23 (4,069.40)	0.9

1. Wilcoxon rank sum test; Pearson's Chi-squared test; Fisher's exact test

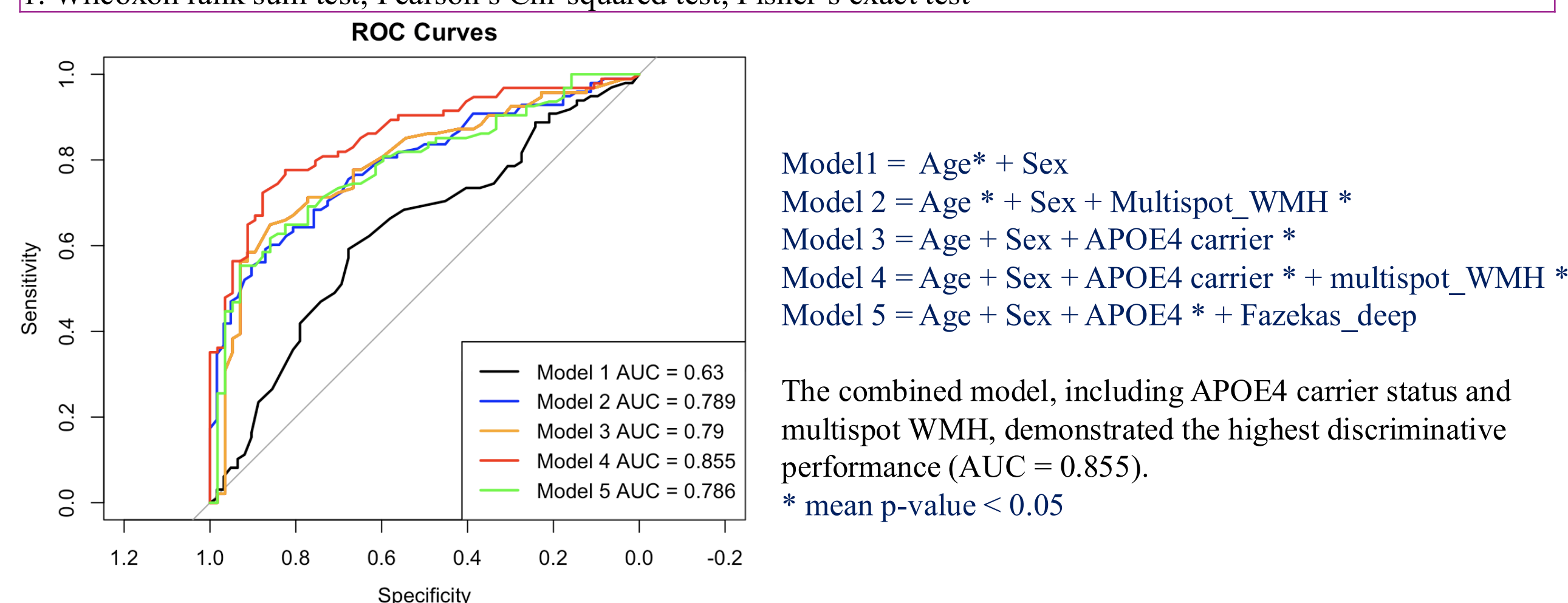


Figure 2. ROC analysis comparing predictive models for amyloid positivity

Results

- Our study revealed presence of multispot WMH patterns are significantly higher in amyloid positive individuals (63% V.S. 18%).
- In contrast, Fazekas scores and the presence of anterior and posterior periventricular WMH patterns did not differ significantly between the two groups.
- Multivariable logistic regression analysis demonstrated that multispot WMH patterns were independently associated with amyloid positivity (OR = 7.04, 95% CI: 2.68–20.03, p < 0.001) after adjustment for age, sex, hypertension, APOE ε4 carrier status, and total microbleed count.
- In addition, multispot WMH patterns were significantly associated with higher amyloid burden measured by the centiloid scale (β = 24.72, 95% CI: 12.03–37.40, p < 0.001).
- The combination of presence of multispot WMH pattern with APOE4 carrier demonstrated good discrimination performance for predicting amyloid positivity, with an AUC of 0.855.

Conclusion

- Our study demonstrates that the multispot WMH pattern is associated with amyloid positivity and higher amyloid burden.
- Moreover, as this pattern is consistent with imaging features of possible cerebral amyloid angiopathy, our findings indicated that CAA-related imaging abnormality could also aid in predicting amyloid positivity in the memory clinic

Reference

- Switzer AR, et al. Boston Criteria v2.0 for Cerebral Amyloid Angiopathy Without Hemorrhage: An MRI-Neuropathologic Validation Study. Neurology. 2024 May 28;102(10):e209386.
- Charidimou A, Baron JC. White Matter Hyperintensity Multispot Pattern Lesions and Cerebrovascular Amyloid Burden in Cerebral Amyloid Angiopathy. Stroke. 2025 Sep;56(9):2767-2771.

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