Ethnic/Racial Differences in Microbleed Distribution in Lobar ICH: An Analysis of the ERICH Study

Neal S Parikh[1]; Ying He[1]; Jie Zhang[1]; Jerome Jeevarajan[2]; Anjail Sharrief[2]

[1]Alnylam Pharmaceuticals, Inc., Cambridge, MA, USA; [2]UTHealth Houston, Houston, TX, USA

For US HCPs Only
Scan to View Congress Material Presented

Conclusions

- **Ethnic/racial differences in anatomical distribution of microbleeds were observed among patients with primary lobar intracerebral hemorrhage (ICH).**
- **These differences may contribute to differences in cerebral amyloid angiopathy (CAA) diagnosis rates across ethnic/racial groups.**
- **Further work is needed to determine whether the findings reflect differences in microvascular disease risk factors rather than differences in CAA prevalence.**

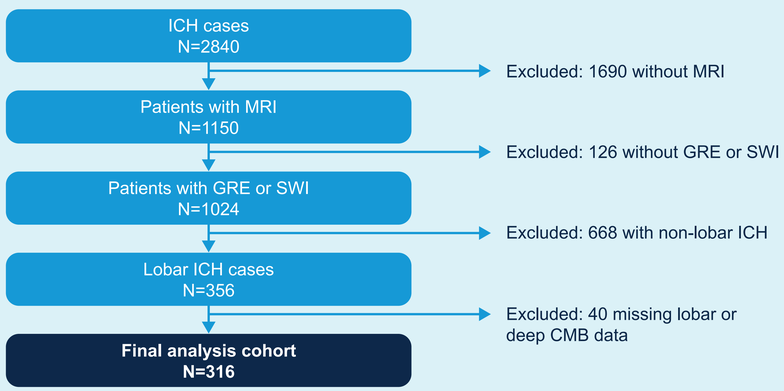
Background

- CAA is the leading cause of lobar ICH.[1]
  - Current diagnostic criteria (Boston Criteria v2.0) use anatomical bleed location to help to determine whether a patient has CAA.
  - The presence of lobar bleeds is an indicator of probable CAA, whereas presence of deep cerebral microbleeds (CMBs) excludes a probable CAA diagnosis.[1]
    - However, deep CMBs were observed in 15% of a small cohort of patients with histopathological evidence of CAA in specimens from lobar ICH evacuation.[2]
- We analyzed data from the Ethnic/Racial Variations of Intracerebral Hemorrhage (ERICH) study[3] to evaluate ethnic/racial differences in anatomical distribution of CMBs among patients with lobar ICH, and their impact on likelihood of meeting criteria for probable CAA.

Methods

- We analyzed data from ERICH, a multicenter, prospective, case–control study of patients with ICH (**Figure 1**).
- We evaluated anatomical (lobar, deep, or cerebellar) CMB distribution by ethnic/racial groups in patients with lobar ICH and available microbleed data.
- Logistic regression was used to assess the association of ethnicity/race with exclusion from probable CAA due to presence of deep CMBs, among patients aged ≥50 years old who had lobar ICH, and ≥1 lobar CMB. Probable CAA was defined as having lobar ICH, ≥1 lobar CMB, and no deep CMBs.
  - Dependent variable was probable CAA versus not probable CAA.
  - Independent variables were age, sex, and ethnic/racial group.
  - Blood-sensitive sequence was not a covariate, because all patients included in the regression had undergone gradient echo.

Figure 1. Patient Selection for ERICH Analysis



CMB, cerebral microbleed; ERICH, Ethnic/Racial Variations of Intracerebral Hemorrhage; GRE, gradient echo; ICH, intracerebral hemorrhage; MRI, magnetic resonance imaging; SWI, susceptibility weight imaging.

Results

Table 1. Characteristics of Patients with Lobar ICH and Available Microbleed Data[a]

Baseline characteristics	Black, non-Hispanic (N=94)	Hispanic, any race (N=87)	White, non-Hispanic (N=135)	Total (N=316)
Age, years, mean (SD)	60.4 (13.8)	60.6 (13.3)	68.3 (13.2)	63.8 (13.9)
Sex, n (%)				
Female	46 (48.9)	45 (51.7)	69 (51.1)	160 (50.6)
Male	48 (51.1)	42 (48.3)	66 (48.9)	156 (49.4)
Insurance type, n (%)				
Medicare only	27 (28.7)	20 (23.0)	67 (49.6)	114 (36.1)
Medicaid only	12 (12.8)	5 (5.7)	4 (3.0)	21 (6.6)
Medicare and Medicaid	9 (9.6)	6 (6.9)	3 (2.2)	18 (5.7)
Private	20 (21.3)	18 (20.7)	43 (31.9)	81 (25.6)
No insurance/Other/ Unknown	26 (27.7)	38 (43.7)	18 (13.3)	82 (25.9)
Hypertension, n (%)	82 (87.2)	62 (71.3)	96 (71.1)	240 (75.9)
Duration, years, mean (SD)[b]	10.9 (10.0)	8.4 (9.0)	13.5 (11.8)	11.3 (10.6)
Number of antihypertensive medications, mean (SD)	1.4 (1.5)	0.9 (1.3)	1.3 (1.3)	1.2 (1.4)
Diabetes, n (%)	34 (36.2)	24 (27.6)	27 (20.0)	85 (26.9)
Elevated cholesterol, n (%)	34 (36.2)	43 (49.4)	78 (57.8)	155 (49.1)
Coronary artery disease, n (%)	18 (19.1)	14 (16.1)	29 (21.5)	61 (19.3)
Atrial fibrillation, n (%)	3 (3.2)	4 (4.6)	20 (14.8)	27 (8.5)
History of Alzheimer's disease, n (%)	8 (8.5)	5 (5.7)	17 (12.6)	30 (9.5)
High alcohol use, n (%)	18 (19.1)	15 (17.2)	16 (11.9)	49 (15.5)
History of tobacco smoking, n (%)	59 (62.8)	44 (50.6)	89 (65.9)	192 (60.8)
Antiplatelet use, n (%)	36 (38.3)	32 (36.8)	72 (53.3)	140 (44.3)
Anticoagulant use, n (%)	6 (6.4)	7 (8.0)	17 (12.6)	30 (9.5)
SBP, mmHg, mean (SD)[c]	186.0 (35.4)	177.9 (37.9)	164.4 (30.1)	174.7 (35.2)
DBP, mmHg, mean (SD)[d]	101.7 (22.9)	95.1 (21.1)	87.4 (20.1)	93.9 (22.0)
Blood-sensitive sequence used, n (%)				
GRE	85 (90.4)	83 (95.4)	111 (82.2)	279 (88.3)
SWI	9 (9.6)	4 (4.6)	24 (17.8)	37 (11.7)

[a]Microbleeds were assessed on GRE or SWI sequences. [b]n=180. [c]n=278. [d]n=277.
DBP, diastolic blood pressure; GRE, gradient echo; ICH, intracerebral hemorrhage; SBP, systolic blood pressure; SD, standard deviation; SWI, susceptibility weight imaging.

- We included 316 patients with lobar ICH and available microbleed data. There were notable differences in age, social determinants of health, and comorbidities including hypertension, diabetes, elevated cholesterol, atrial fibrillation, and Alzheimer's disease, among other patient characteristics (**Table 1**).
- White, non-Hispanic patients had more lobar CMBs and fewer deep CMBs than Black, non-Hispanic and Hispanic patients, and were correspondingly more likely to meet probable CAA criteria (**Table 2**).
  - Among patients ≥50 years old with lobar ICH and ≥1 lobar CMB, the proportion of patients who also had a deep CMB was 69.4% for Black, non-Hispanic patients, 38.1% for Hispanic patients, and 29.8% for White, non-Hispanic patients.
  - After adjustment, Black, non-Hispanic patients were three times more likely than White, non-Hispanic patients to be excluded from probable CAA criteria owing to presence of deep CMBs. This was not observed for Hispanic patients (**Table 2**).

Table 2. CMB Anatomical Distribution in Patients with Lobar ICH

	Black, non-Hispanic (N=94)	Hispanic, any race (N=87)	White, non-Hispanic (N=135)	Total (N=316)
CMB by anatomical region, mean (SD)				
Lobar CMB	3.9 (8.3)	5.7 (26.2)	10.1 (34.4)	7.0 (26.8)
Deep CMB[a,b]	1.9 (4.2)	1.9 (8.6)	0.8 (4.5)	1.4 (5.9)
Cerebellar CMB	2.6 (11.4)	0.3 (0.9)	1.2 (6.9)	1.4 (7.7)
N	94	87	135	316
Lobar:deep[a] CMB ratio, mean (SD)	2.2:1 (3.1)	1.5:1 (4.3)	10.3:1 (32.2)	4.2:1 (17.2)
N	36	17	20	73
≥1 deep CMB,[c] n (%)	28 (70.0)	11 (44.0)	15 (30.0)	54 (47.0)
N	40	25	50	115
Probable CAA by Boston Criteria v2.0,[d] n (%)	11 (11.7)	13 (14.9)	33 (24.4)	57 (18.0)
N	94	87	135	316
Adjusted likelihood of exclusion from probable CAA criteria due to deep CMBs vs White, non-Hispanic, odds ratio (*p* value)	3.58 (*p*=0.013)	0.98 (*p*=0.965)	–	–
N	36	21	47	104

[a]Defined as subcortical structures and brainstem. [b]Brainstem CMB data were missing for one patient. [c]Among those with lobar ICH and ≥1 lobar CMB. [d]Defined here as patients ≥50 years old who have lobar ICH with ≥1 lobar CMB, and no deep CMBs.
CAA, cerebral amyloid angiopathy; CMB, cerebral microbleed; ICH, intracerebral hemorrhage; SD, standard deviation.

Disclosures
NSP, **YH**, and **JZ** are employees of, and shareholders in, Alnylam Pharmaceuticals. **JJ** has no financial or non-financial conflicts of interest to disclose. **AS** has provided consulting services for Bayer and BMS/J&J Alliance.

Acknowledgments
Medical writing support provided by Adam Errington, PhD of PharmaGenesis Cardiff, Cardiff, UK, was funded by Alnylam Pharmaceuticals in accordance with Good Publication Practice (GPP) guidelines.

Funding
This study is funded by Alnylam Pharmaceuticals.

References
1. Charidimou A *et al. Lancet Neurol* 2022;21:714–25. **2.** Huhndorf M *et al. Front Neurol* 2023;14:1146737. **3.** Woo D *et al. Stroke* 2013;44:e120–5.

Presented at the 10th International Cerebral Amyloid Angiopathy (ICAA) Conference, September 15–17, 2026, Banff, AB, Canada