Posterior White Matter Disease Distribution as a Predictor of Cerebral Amyloid Angiopathy

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Posterior White Matter Disease Distribution as a Predictor of Cerebral Amyloid Angiopathy
Cerebral Amyloid Angiopathy

Cerebrovascular disease

SVD

CAA

Large Vessel Disease

SVD – small vessel disease
CAA – cerebral amyloid angiopathy
Cerebral Amyloid Angiopathy

Age, Genetic Alzheimer’s disease

β-amyloid deposition

Dysfunction of vessels media:
- Fragile wall
- Impairment of perfusion

Intracerebral hemorrhage Cognitive impairment
- Cortical and leptomeningeal arteries (not deep arteries)
- Posterior (occipital) predilection
Cerebral Amyloid Angiopathy

Image: Loyola University Chicago Stritch School of Medicine. 1999
Cerebral Amyloid Angiopathy

Lobar ICH
Cerebral Amyloid Angiopathy

MRI markers of CAA:

- Cerebral microbleeds
  (strictly Lobar pattern)
Cerebral Amyloid Angiopathy

Hemosiderin-specific sequences
Cerebral Amyloid Angiopathy

J Rosand, et al. 2005
Cerebral Amyloid Angiopathy

MRI markers of CAA:

- Cerebral microbleeds
  (strictly Lobar pattern)

- Dilated perivascular spaces
  (in the white matter region)

- White matter hyperintensities
Posterior White Matter Disease Distribution as a Predictor of Cerebral Amyloid Angiopathy
White Matter Hyperintensities

Leukoaraiosis
WMH

T2 FLAIR sequence
Comparing spatial distribution of WMH

CAA-related ICH
Subjects

VS

Normal elderly
Subjects

Higher proportions of subjects with obvious occipital dominant WMH

Objectives

To evaluate and compare the anteroposterior (AP) distribution of WMH between CAA and non-CAA patients, in the absence of ICH
In the absence of ICH:

- A posterior distribution of WMH should associate with a strictly lobar pattern of MB and a high burden of WM-DPVS
- The posterior WMH distribution should be a predictor of CAA
Methodology

Study Population

- Memory clinic cohort
- Pathology cohort

Neuroimaging analysis

- MB, DPVS
- AP center of WMH
Methodology

Memory clinic cohort

Inclusion criteria

290 patients

Exclusion criteria

259 patients

85 patients eligible for DPVS analysis

259 patients eligible for MB analysis

Strictly lobar MB (n = 59)

No microbleed (n = 200)
Methodology

85 patients eligible for DPVS analysis

- WM > BG (n = 38)
- WM = BG (n = 39)
- WM < BG (n = 8)
Mass General’s Database

Inclusion criteria

72 patients included in pathological cohort

Exclusion criteria

59 patients eligible for analysis

CAA (n = 41)

Non-CAA (n = 18)
Methodology

Study Population
- Memory clinic cohort
- Pathology cohort

Neuroimaging analysis
- MB, DPVS
- AP center of WMH

Higher value = more anterior distribution
Lower value = more posterior distribution
Results

Memory Clinic Cohort

259 subjects were eligible for MB analysis

Strictly lobar MB?

- Strictly lobar MB (n = 59)
- No MB (n = 200)

AP center of WMH, mean (SD)

- 5.14 (11.48)*,§
- 11.23 (11.89)*,§

Memory Clinic Cohort

85 subjects were eligible for DPVS analysis

Predominant area of DPVS severity

- WM > BG (n = 38)
- WM = BG (n = 39)
- WM < BG (n = 8)

AP center of WMH, mean (SD)

- 3.13 (9.40)*,§
- 7.54 (10.66)*,§
- 18.17 (5.52)*,§

Pathology Cohort

59 subjects were eligible for analysis

CAA at pathology?

- CAA (n = 41)
- Non-CAA (n = 18)

AP center of WMH, mean (SD)

- 7.52 (9.39)*,§
- 16.86 (6.10)*,§

* p = 0.009, β = 4.63, 95% CI (1.18 to 8.08); † p = 0.001, β = 5.61, 95% CI (2.28 to 8.94); ‡ p = 0.001, OR (95% CI) = 1.19 (1.07 to 1.32)

§ Female sex was independently associated with more anterior distribution of WMH in all models (p = 0.001, 0.008, 0.004)

AP-anteroposterior; BG-basal ganglia; CAA-cerebral amyloid angiopathy; CI-confidence interval; DPVS-dilated perivascular spaces; MB-microbleeds; OR-odd ratio; SD-standard deviation; WM-white matter; WMH-white matter hyperintensities
Interpretations

- In patients without ICH, strictly lobar MB and high degree of WM-DPVS was found to be associated with posterior WMH distribution.

- Posterior WMH distribution may be a potential predictor of CAA at pathology.

- Female patients tended to have more anterior distribution of WMH.
Assessment of AP distribution of WMH may have additional diagnostic importance in patients with suspected CAA, prior to ICH.
Thank you!

Namnao National Park, Thailand