SUPPLEMENTAL MATERIAL

Article Title: Association between Anatomical Variations of the Circle of Willis and Covert Vascular Brain Injury in the General Population

Journal Name: Translational Stroke Research

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Supplemental Table 1 The Prevalence of Variation of the Circle of Willis

Type	Complete PC			Incomplete PC							Total
	A	B	C	D	E	F	G	H	I	J	K	
Complete AC												
I	53	13	27	223	150	19	14	17	9	5	6	536
II	6	3	2	42	15	7	4	9	6	1	6	101
Incomplete AC												
III	2	0	4	26	18	8	3	5	2	1	3	72
IV	45	9	22	130	91	12	10	10	6	2	6	343
V	1	0	1	0	1	0	0	0	0	0	0	3
Total	107	25	56	421	275	46	31	41	23	9	21	1055

Abbreviation: AC = anterior circulation; PC = posterior circulation

Supplemental Table 2 Distribution of Hypoplastic/Absent A1 and P1 on Right and Left Sides

Segment	Normal	Hypoplasia	Absence	Mean rank sum
A1				
Left side	995	43	17	1026.87
Right side	939	61	55	1084.13
P1				
Left side	938	73	44	1028.24
Right side	884	102	69	1082.76

Abbreviation: A1 = precommunicating anterior cerebral artery; P1 = precommunicating posterior cerebral artery

Supplemental Table 3 Univariate Analysis of Association of Variations of the Circle of Willis with Covert Vascular Brain Injury

Outcomes	Anterior Circulation						Posterior Circulation					
	Symmetric	Asymmetric		Complete	Incomplete		No FTP	FTP		Complete	Incomplete	
		OR (95% CI)	p		OR (95% CI)	p		OR (95% CI)	p		OR (95% CI)	p
Lacune												
Any lacune	1(Ref)	1.425(0.906–2.243)	0.124	1(Ref)	1.336(0.924–1.931)	0.122	1(Ref)	1.298(0.862–1.956)	0.211	1(Ref)	0.908(0.569–1.449)	0.686
Lacune-BG	1(Ref)	1.505(0.889–2.548)	0.126	1(Ref)	1.334(0.863–2.065)	0.194	1(Ref)	1.122(0.682–1.844)	0.651	1(Ref)	0.911(0.524–1.585)	0.741
Lacune-WM	1(Ref)	1.249(0.693–2.253)	0.458	1(Ref)	1.328(0.831–2.123)	0.234	1(Ref)	**1.733(1.054–2.847)**	**0.028**	1(Ref)	0.957(0.524–1.749)	0.887
WMH												
Severe PVH	1(Ref)	**1.674(1.128–2.484)**	**0.010**	1(Ref)	1.193(0.860–1.656)	0.290	1(Ref)	1.330(0.925–1.913)	0.123	1(Ref)	**1.843(1.124–3.023)**	**0.014**
Severe DWMH	1(Ref)	**1.668(1.021–2.725)**	**0.039**	1(Ref)	0.927(0.607–1.417)	0.728	1(Ref)	**1.655(1.063–2.579)**	**0.025**	1(Ref)	**2.062(1.052–4.043)**	**0.032**
CMB												
Any CMB	1(Ref)	0.910(0.520–1.593)	0.742	1(Ref)	**1.563(1.040–2.350)**	**0.031**	1(Ref)	1.148(0.722–1.825)	0.560	1(Ref)	1.720(0.922–3.209)	0.085
Deep or infratentorial CMB	1(Ref)	0.485(0.191–1.235)	0.122	1(Ref)	1.594(0.929–2.735)	0.088	1(Ref)	1.077(0.578–2.008)	0.815	1(Ref)	1.361(0.633–2.928)	0.429
Strictly lobar CMB	1(Ref)	1.513(0.754–3.034)	0.241	1(Ref)	1.528(0.850–2.746)	0.154	1(Ref)	1.235(0.641–2.382)	0.527	1(Ref)	2.438(0.864–6.881)	0.082

Outcomes	Anterior Circulation						Posterior Circulation					
	Symmetric	Asymmetric		Complete	Incomplete		No FTP	FTP		Complete	Incomplete	
		OR (95% CI)	p		OR (95% CI)	p		OR (95% CI)	p		OR (95% CI)	p
EPVS												
Severe EPVS-BG	1(Ref)	1.025(0.628–1.674)	0.920	1(Ref)	0.989(0.678–1.441)	0.953	1(Ref)	0.708(0.443–1.131)	0.147	1(Ref)	**2.061(1.135–3.743)**	**0.015**
Severe EPVS-WM	1(Ref)	0.993(0.620–1.592)	0.978	1(Ref)	0.726(0.501–1.052)	0.089	1(Ref)	**0.606(0.381–0.964)**	**0.033**	1(Ref)	0.921(0.586–1.448)	0.722

Abbreviations: OR = odds ratio; CI = confidence interval; Ref = reference; FTP = fetal-type posterior cerebral artery; WMH = white matter hyperintensity; PVH = periventricular hyperintensity; DWMH = deep white matter hyperintensity; CMB = cerebral microbleed; EPVS = enlarged perivascular space; BG = basal ganglia; WM = white matter

STROBE Statement

	Item No.	Recommendation	Page No.
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of	

		controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	Flow chart
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the	Flow chart

			study, completing follow-up, and analysed	
			(b) Give reasons for non-participation at each stage	
			(c) Consider use of a flow diagram	
Descriptive data		14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
			(b) Indicate number of participants with missing data for each variable of interest	
			(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data		15*	*Cohort study*—Report numbers of outcome events or summary measures over time	7
			Case-control study—Report numbers in each exposure category, or summary measures of exposure	
			Cross-sectional study—Report numbers of outcome events or summary measures	
Main results		16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-9
			(*b*) Report category boundaries when continuous variables were categorized	
			(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses		-
Key results	18	Summarise key results with reference to study objectives		10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision.		13

		Discuss both direction and magnitude of any potential bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11
Generalisability	21	Discuss the generalisability (external validity) of the study results	10-11
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org