

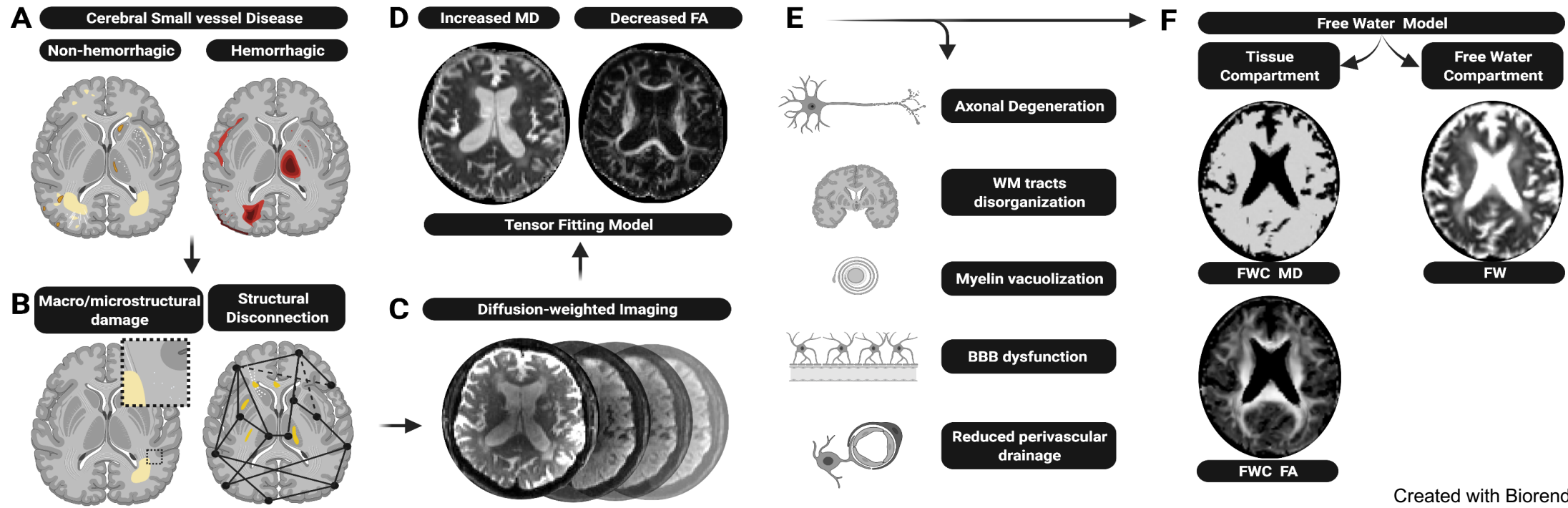
White Matter Free Water in Cerebral Amyloid Angiopathy: a diffusion-based study

Forma de apresentação: Tema Livre

Área técnica: Neurorradiologia.

Tipo de estudo: Trabalho Original

Figure 1. Cerebral Small Vessel Diseases and the Free Water Diffusion Model



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(A) Cerebral small vessel diseases (cSVDs) may manifest with hemorrhagic and non-hemorrhagic brain lesions, which contribute to (B) macro and microstructural white matter damage, and structural dysconnectivity, thought to underlie vascular cognitive impairment. (C) Diffusion-weighted imaging is one of the most promising MRI techniques to assess white matter vascular injury, (D) usually perceived as increased MD and decreased FA. (E) However, there is still limited understanding about MD and FA's histopathological correlates, thought to represent either axonal degeneration, WM tracts disorganization, myelin vacuolization, BBB dysfunction with interstitial edema and/or reduced perivascular drainage. (F) The Free Water model separates the component of unrestricted water (free water) from the tissue component (intracellular and extracellular water in close proximity to cells), offering the opportunity to capture different underlying pathological changes.

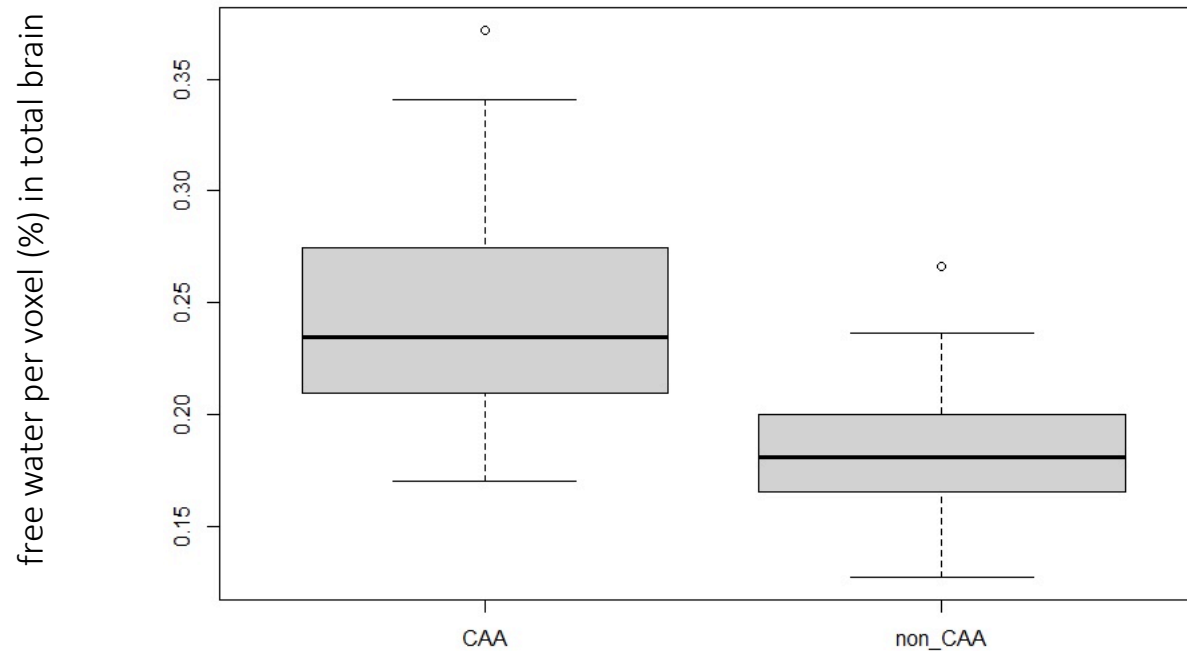
Glossary: MD= Mean Diffusivity; FA= Fractional Anisotropy; WM= White Matter; BBB= Blood-brain-barrier; FW= Free Water; FWC= Free Water-corrected.

Table 1. Patients characteristics

Diagnosis		CAA (n=91)	non-CAA (n=38)	p value
Age, y		75.6(54.9-95.9)	71.6(56.3-86.1)	0.008*
Sex	Female	46.1%(n=42)	44.7%(n=17)	1
Vascular risk factors	Hypertension	66.3%(57)	67.6%(23)	1
	Diabetes	16.3%(14)	11.8%(4)	0.73
	Dyslipidemia	70.1%(61)	70.1%(24)	1
Neuropsychological performances	MMSE Z score [median(IQR)]	-1.25(-3.13, 0)	0(0, 0)	0.01*
Imaging	Total CMB [median(IQR)]	10(2, 46.5)	0(0, 0)	< 0.0001*
	High CSO-PVS score (>2) (No.) (%)	51(56)	0(0%)	< 0.0001*
	White matter hyperintensity volume [median(IQR)]	0.004(0.002, 0.008)	0.001(0.0002, 0.002)	< 0.0001*
	Cortical superficial siderosis (presence) (No.) (%)	33(36.3%)	0(0%)	< 0.0001*
	Brain volume (mean) [SD]	0.62(0.04)	0.66(0.05)	< 0.0001*

Glossary: CAA = cerebral amyloid angiopathy; CMB = cerebral microbleeds; CSO-PVS = perivascular spaces in the centrum semiovale; MMSE = mini mental state examination.

Figure 2. Mean free water in CAA and non-CAA patients



Wilcoxon Rank Sum Test $p < 0.001$

ANOVA $FW \sim \text{Group} + \text{MMSE Zscores} + \text{CMB} + \text{CSO PVS} + \text{nWMHV} + \text{cSS} + \text{Brain volume}$

Bonferroni : $p < 0.0001$

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Table 2. Association between FW and MRI markers of small-vessel disease in CAA participants.

	Std. B	95% CI	p value
CAA (n=91)			
Total CMB	4.77 ⁻⁵	-3.48 ⁻⁶ , 9.89 ⁻⁵	0.07
CSO PVS score >2	0.02	0.005, 0.04	0.009*
nWMHV	2.11	1.01, 3.23	0.0002*
cSS	0.02	0.003, 0.04	0.02*
TBV	-0.34	-0.57, -0.11	0.005*

FW ~ Total_CMB + CSO >2 + nWMHV + cSS + TBV + Age, data=CAA

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Table 3. Association between FW and cognitive performance in CAA participants, adjusted for conventional cSVD markers

	Std. B	95% CI	<i>P</i> value
CAA (n=91)			
MMSE Z scores	-8.24	-27.88, 11.39	0.41
Memory	-3.8	-12.76, 5.15	0.40
Language	-1.41	-10.55, 7.73	0.76
Processing speed/Attention	-0.83	-7.02, 5.36	0.79
Executive function	-3.36	-11.63, 4.91	0.42

Cognitive performance ~ FW + CMB + CSO PVS SCORE + nWMHV + cSS + TBV

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