

### Comprehensive Imaging Analysis of Intracranial Atherosclerosis

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#### Supplementary material

#### Tables

**Supplementary table 1. Features of Symptomatic Plaques**

Imaging Technique	Stenosis	PB	IPH	Positive Remodeling	Fibrous cap	Gd Enhancement
DSA	++++	-	-	-	-	-
CTA	+++	+	-	+	+	-
MRA	+++	+	-	+	-	+
HR-MRI	+++	++++	++++	++++	+++	++++
Transcranial US	++	-	-	-	-	-
IVUS	+++	+++	++++	++	++++	-
OCT	+++	++++	++++	++++	++++	-

The accuracy of diagnostic capability is denoted by the number of plus signs, ranging from "+" for the least accurate to "++++" for the most accurate. PB: plaque burden. DSA: Digital subtraction angiography. CTA: Computed tomography angiography. MRA: Magnetic resonance angiography. HR-MRI: High resolution magnetic resonance imaging. Transcranial US: Transcranial ultrasound. IVUS: Intravascular ultrasound. OCT: Optic coherence tomography. IPH: Intraplaque hemorrhage. Gd: Gadolinium.

**Supplementary table 2. Method for quantification of Plaque Enhancement.**

Author	Method	MRI	Metric	Finding
Kim et al(1)	Expert adjudication	3T	Presence of Enhancement	Plaque enhancement was independently associated with stroke recurrence (HR: 7.42, 95% CI 1.74–31.75, p = 0.007).
Qiao et al(2)	Expert adjudication	3T	Enhancement grade	Grade 2 enhancement, adjusted for plaque thickness, was associated with symptomatic plaques (OR 34.6; 95% CI 4.5, 266.5) compared with grade 0. Grade 0 was only present in asymptomatic plaques.
Shi et al (3)	Objective 2D	3T	Histogram-derived coefficient of variation	Coefficient of variation was an independent predictor for symptomatic plaques in both the MCA and BA with a sensitivity of 79% and a specificity of 80%
Shi et al(4)	Objective 2D	3T	Enhancement ratio	Enhancement ratio was independently associated with acute/subacute symptoms. The enhancement ratio for acute/subacute symptomatic plaques was $24.20 \pm 29.46$ while for asymptomatic plaques was $3.38 \pm 21.91$ p <0.001
Shi et al (4)	Objective 2D	3T	Radiomics	A model that included plaque radiomic features from T1 and T1+Gd images had a sensitivity of 97.0% and specificity of 79.0% for acute/subacute symptomatic plaques
Huang et al(5)	Objective 2D	3T	CR Stalk	CR Stalk $\geq 0.56$ had a sensitivity of 68.3% and a specificity of 81.8% for identifying symptomatic plaques
Fakih et al (6)	Objective 2D	7T	CR Stalk	CR Stalk $\geq 0.53$ had a sensitivity of 78% and a specificity of 62% for identifying symptomatic plaques
Sanchez et al(7)	Objective 3D	7T	3D Gd-uptake	3D Gd uptake of $\geq 1.23$ had a sensitivity of 86% versus and specificity of 71% for symptomatic plaques

The presence of enhancement after the administration of contrast-Gd has been determined with different approaches. Kim et al adjudicated enhancement subjectively on visual assessment as present or absent.(1) Qiao et al used an enhancement scale, grade 0 = enhancement less than normal arterial walls, grade 1 = enhancement higher than grade 0 but lower than the pituitary stalk, and grade 2 = enhancement greater than or equal to that of the pituitary stalk.(2) Shi et al generated histograms from the coefficient of variation derived from signal intensity change. The coefficient of variation was calculated as the signal intensity standard deviation/ mean signal intensity.(3) Shi et al used radiomics for determining enhancement. This post-acquisition

processing method yields multiple features based on a voxel-derived histogram, textural, and shape analysis.(4) Shi et al also used the enhancement ratio which can be quantified as :  $((\text{signal of plaque [post-contrast]}/\text{signal of grey matter [post-contrast]}) / (\text{signal of plaque [pre-contrast]}/\text{signal of grey matter [pre-contrast]}) - 1) \times 100\%$ . Other investigators such as Huang et al and Fakhri et al, have used the pituitary stalk ratio (CR stalk) for determining the amount of enhancement. CR stalk is measured using the following formula: Signal intensity of the plaque in T1+Gd/ Signal intensity of the pituitary stalk in T1+Gd.(6) 3D Gd uptake is quantified as:  $(\text{mean of the Plaque T1+Gd} - \text{mean of the Plaque T1}) / \text{Standard deviation of the plaque in T1}$ .(7)

## References

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