# STROKE

### THE CHALLENGE OF ACCURATE STROKE ASSESSMENT

Acute ischemic stroke is a leading cause of morbidity in aging populations worldwide, making timely prevention and treatment critical. Seeking emergency medical care at the first signs of stroke is essential for improving outcomes.

To diagnose stroke, computed tomography (CT) or magnetic resonance imaging (MRI) are typically employed. Ideally, advanced imaging techniques like CT perfusion or MR perfusion and diffusion sequences are included in the diagnostic protocol.

Perfusion maps, such as Tmax, are often used as pseudo-markers of the ischemic 'penumbra'—the area of potentially salvageable tissue. In contrast, markers such as cerebral blood flow (CBF) and the apparent diffusion coefficient (ADC) are commonly associated with irreversible tissue damage.

#### KEY CONSIDERATIONS IN STROKE IMAGING AND DIAGNOSIS

- > Critical for Timely Intervention: Accurately estimating the core and penumbra is vital for guiding treatment decisions, particularly in cases with unknown or delayed presentation after stroke onset.
- > Data Processing Challenges: Achieving automated, reliable quantification of lesion volumes and their precise locations remains a complex task, requiring robust processing systems to ensure accurate diagnostics.



SVD Tmax

Vascular Model

#### THE VASCULAR MODEL: ADVANCING STROKE SOLUTIONS

At Cercare Medical, the Vascular Model (VM) is a key component of all our stroke imaging solutions, offering enhanced clarity in detecting hypoperfused areas where traditional models often fall short.

- > Enhanced Visualization of Hypoperfused Tissue: The VM provides clearer insight into potentially hypoperfused regions, helping clinicians make more informed decisions.
- > Improved Alignment with Final Infarct: Our research suggests that lesions identified using the VM more accurately reflect follow-up infarction, offering a more reliable diagnostic tool.
- > Better Correlation with Neurological Deficits: In many cases, lesions observed through the VM align more closely with patients' neurological symptoms than those identified by standard techniques, leading to more precise assessments.

#### STROKE SOLUTIONS FROM CERCARE MEDICAL

Cercare Medical offers a suite of advanced, Al-driven imaging solutions for comprehensive stroke assessment, all part of the **Cercare Medical Neurosuite**.

This suite includes four distinct products:

Cercare CT Stroke, Cercare CT Stroke Advanced, Cercare MR Stroke, and Cercare MR Stroke Advanced, each designed to enhance diagnostic accuracy using both CT and MRI technologies with a special focus on metabolic brain perfusion.

For **Cercare CT Stroke Advanced** users, there are additional tools available, including **ASPECTS, LVO**, and **ICH**, providing further precision in stroke diagnosis and treatment planning.

Cercare Medical has developed specialized metabolic brain perfusion maps, including oxygen extraction fraction (OEF) and cerebral metabolic rate of oxygen (CMRO2), in addition to traditional perfusion markers—such as relative cerebral blood flow (rCBF), relative cerebral blood volume (rCBV), mean transit time (MTT), and time to maximum (Tmax)— to provide a more accurate understanding of ischemic tissue and its progression.

**Cercare Medical Neurosuite** is fully automatic limiting the need of manual interventions by users, allowing an easier access to patients' stroke assessment .

<u>Cercare Medical</u> Metabolic Perfusion Imaging.

# **STROKE CASES**

#### MR STROKE: LESION IDENTIFICATION AND QUANTIFICATION

Cercare Medical Stroke solution provides outlines for suspected stroke lesions (including core and hypoperfused volumes) and mismatch results supporting clinicians in the treatment decisions.

On the example on the right image, infarct lesion is shown in purple and hypoperfused volume in yellow.

The results can be displayed as mosaics (see image on the right) to show full results in a glance compatible with all DICOM viewers (e.g. PACS viewer) and also by email notification.

The results can also be displayed separately, as shown on the images on the right, allowing the user to scroll through the series to analyze more in-depth the results.

On the MR Stroke example on the right, the infarct lesion -in purple- is overlayed on the DWI series and the hypoperfused volume -in yellow- is overlayed on the MinIP. Overlay outputs are fully customizable to the user's preferences.

#### MR STROKE: USE OF ADVANCED PERFUSION MAPS

OEF and CMRO2 maps are unique advanced biomarkers provided by Cercare perfusion processings. Jointly, they can provide deeper insight into tissue metabolism and viability.

In Bani-Sadr et al. study «Oxygen Extraction Fraction Mapping on Admission Magnetic Resonance Imaging May Predict Recovery of Hyperacute Ischemic Brain Lesions After Successful Thrombectomy: A Retrospective Observational Study», 2024, Stroke AHA, it is shown that those markers can be used as predictive tools in stroke care.

In the MR stroke example on the right images, we can observe an elevated OEF in the affected region indicating compensatory oxygen extraction fraction by the brain tissue in response to the ischemia. The CMRO2 map shows a decrease in the same area, compared to the controlateral side, indicating that increased OEF has only partially allowed for sustained normal tissue oxygen metabolism in the affected area.







Oxygen extraction fraction (OEF)

Relative cerebral metabolic rate of oxygen(rCMRO2)

Cercare Medical Metabolic Perfusion Imaging Cercare Medical Neurosuite offers a comprehensive suite of Al-driven imaging tools for stroke assessment, consisting of four distinct products: Cercare CT Stroke, Cercare CT Stroke Advanced, Cercare MR Stroke, and Cercare MR Stroke Advanced. These solutions are designed to enhance stroke diagnosis and treatment planning with cutting-edge features.

### STROKE LESIONS IDENTIFICATION AND QUANTIFICATION

Each solution automatically identifies suspected infarcted and hypoperfused lesions. These results can be obtained using literature-based thresholds method (CE and FDA cleared) or our unique AI-based method (CE marked only)

### ICH DETECTION

The AI-powered ICH detection module, available in **Cercare Stroke Advanced** products, helps rule out stroke-related intracerebral hemorrhage as part of the comprehensive stroke assessment.

# LVO DETECTION

Cercare Medical Neurosuite automatically detects the potential location of large vessel occlusions (LVO), enabling targeted ischemic stroke diagnosis.

#### ASPECTS SCORING

Cercare Medical Neurosuite automatically detects potential early infarct changes on Non-Contrast CT.

# AUTOMATIC MOTION CORRECTION

Patient motion can degrade image quality, but **Cercare CT/MR Stroke** products automatically correct for motion artifacts, ensuring high-quality imaging.

### AUTOMATIC IMAGE FUSION

The software handles automatic coregistration of imaging series and sequences, enabling faster image interpretation without manual adjustments.

#### PERFUSION PARAMETRIC MAPS

Gain deeper insights into brain tissue viability with advanced perfusion maps. Each product generates both traditional perfusion maps (CBV, CBF, MTT, etc.) and unique perfusion biomarkers (CTH, OEF-based models, and rCMRO2-based models) to provide critical information on tissue health and progression. Maps can be displayed in greyscale or with onboard color maps.

# WORKS WITH BOTH CT AND MRI

Cercare Medical Neurosuite provides stroke and perfusion parametric maps for both CT and MRI modalities, ensuring comprehensive stroke assessment in a single application.

# MULTI-VENDOR COMPATABILITY

Cercare Medical Neurosuite products work seamlessly with a wide range of scanners, offering flexibility and adaptability to your existing equipment.

# **FLEXIBLE INTEGRATION**

The solutions integrate easily into your current clinical workflows, utilizing standard DICOM files for imaging outputs, and ensuring compatibility with PACS and viewer systems.

#### WORKS WITH YOUR EXISTING PROTOCOLS

Cercare Medical solutions require no changes to your existing clinical protocols, providing immediate benefits upon implementation.



# **CERCARE MEDICAL NEUROSUITE**

#### **CERCARE CT STROKE**

Fully automated computation of CT perfusion maps and automated segmentation of infarct core and hypoperfused volumes for a complete decision support Stroke solution using the thresholds method.

#### CERCARE CT STROKE ADVANCED

Complete decision support Stroke solution with fully automated computation of CT perfusion maps and automated delineation of infarct core and hypoperfused volumes by using either thresholds method or Cercare Medical's unique AI algorithm.

### CE FDA

CE FDA

CE

DIFFUSION

Mean DWI, BO, ADC

#### SVD BASED PERFUSION MAPS

CBF, CBV, MTT, Tmax, MaxIP, TTP

#### THRESHOLD BASED LESION QUANTIFICATION

Tmax and CBF thresholds and mismatch

CE	FDA CLEARED	
∢	<b>v</b>	SVD BASED PERFUSION MAPS CBF, CBV, MTT, Tmax, MaxIP, TTP
<	<b>V</b>	VASCULAR MODEL BASED PERFUSION MAPS CBF, CBV, MTT, Delay, CTH, COV, OEF, CMRO2, LOI
<b>V</b>		THRESHOLD BASED LESION QUANTIFICATION Tmax, Delay and CBF thresholds and mismatch
<		Core and Hypoperfusion lesion and mismatch
∢		ADD-ONS: ASPECTS: NCCT for ASPECTS, ASPECTS Regions - includes montage and overlay series for ASPECTS
$\checkmark$		LVO: LVO Detection (coronal and axial), MaxIPs in 3 planes, vertical and horizontal MaxIPs.
<b>V</b>		ICH: Al based hemorrhage detection - Includes montage and overlay series for ICH lesion

**RESEARCH - NO CE/FDA Clearance** Al-based LVO detection (CT angiography)

SVD BASED DSC PERFUSION MAPS

#### CERCARE MR STROKE

Fully automated computation of MR perfusion maps and automated segmentation of infarct core and hypoperfused volumes for a complete decision support Stroke solution using the thresholds method.

### CERCARE MR STROKE ADVANCED

Complete decision support Stroke solution with fully automated computation of MR perfusion maps and automated delineations of infarct core and hypoperfused volumes by using either thresholds method or Cercare Medical's unique Al algorithm.

•	CBF, CBV, MTT, Tmax, MinIP, TTP
∢	THRESHOLD BASED LESION QUANTIFICATION Tmax and ADC thresholds and mismatch
FDA CLEARED	
<	DIFFUSION Mean DWI, BO, ADC
∢	SVD BASED DSC PERFUSION MAPS CBF, CBV, MTT, Tmax, MinIP, TTP
<	VASCULAR MODEL BASED DSC PERFUSION MAPS CBF, CBV, MTT, Delay, CTH, COV, OEF, CMRO2, Leakage, LC

THRESHOLD BASED LESION QUANTIFICATION Tmax, Delay and ADC thresholds and mismatch

AI BASED LESION QUANTIFICATION Core and Hypoperfusion lesion and mismatch

# <u>Cercare Medical</u>

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