Supplementary methods

Ethics statement

Local Institutional Review Boards (IRBs) approved the collection of anonymized clinical data with patients' consent into the registry database to monitor and improve the quality of stroke care (IRB approval No. 2015-12-027 and DFH16MR00289).

Study population

Patients with acute cardioembolic stroke, due to nonvalvular atrial fibrillation (AF), who visited an emergency room within 7 days of symptom onset were prospectively included at two tertiary hospitals between April 2016 and February 2018. Magnetic resonance angiography (MRA) of the brain and neck was performed to exclude patients with significant stenosis of the middle cerebral and carotid arteries on the lesion side. AF was diagnosed based on medical history and based on standard or continuous electrocardiography during stroke unit admission. Therefore, AF was not classified according to type (paroxysmal, persistent, or permanent) as defined by episode timing and termination. According to the Trial of Org 10172 in Acute Stroke Treatment classification, using a magnetic resonance imaging (MRI)-based diagnostic algorithm, other etiologies affecting embolic stroke such as malignancies, severe infection, major bleedings, and two or more undetermined causes (coexistence of other stroke etiologies such as large artery atherosclerosis, small vessel occlusion, and cardioembolism) were also excluded.[5] Patients with unstable vital signs and patients who did not consent to this study were also excluded. All patients were examined using abdominal MRI and transthoracic echocardiography within 7 days of onset. Therefore, patients who were first diagnosed with AF a week after symptom onset with 24-hour Holter monitoring and implantable devices were also excluded from our study. A detailed flow diagram showing study participant selection is shown in Supplementary Figure 1.

Magnetic resonance imaging protocols

MRI and MRA of the intra- and extracranial brain were performed using a 3.0 Tesla scanner. Brain diffusion-weighted imaging parameters (repetition time 7,500 ms, echo time [TE] 84 ms, matrix number 128×128, 2 b values 0 and 1,000 s/mm^2) included a slice thickness measuring 5 mm and an inter-slice gap measuring 2 mm. Prospectively, all patients underwent abdominal MRI at 1.5T (Magnetom Avanto, Siemens Medical Solutions, Erlangen, Germany) within 7 days of ictus. The following protocol was followed: the body coil served as a transmitter and a six-element spine matrix coil in combination with the body matrix as a receiver. After routine localization and T2-weighted imaging, a series (b=50, 400, 800 s/mm^2) of isotropic diffusion-weighted imaging was acquired using a spin-echo-based echo-planar imaging sequence in combination with spectral adiabatic inversion recovery fat suppression. The acquisition was gated using prospective acquisition correction (PACE) respiratory triggering (TR; 3,100 to 6,500 ms) and tuned with the following parameters: TE 71 ms; slice thickness 6 mm; slice gap 1.625 mm; field of view 380×285 mm; matrix 192×115; bandwidth 1,736 Hz/pixel; averages 2; and Generalized Autocalibrating Partially Parallel Acquisitions (GRAPPA) factor 2. Diffusion gradients (25 mT/m) were applied in the phase, read, and Z-direction separately. In total, 32 transverse slices were acquired with a 1.625-mm slice gap to cover the whole liver within an average total acquisition time of 8.1 minutes (range, 4.7 to 11.1). The image acquisition took place in an interleaved mode; first slices 1, 4 and 7, 10, 13, 16, 22, 25, 28, 31 were consecutively acquired with b=0 value, then the same slices with b=50 value and so on up to b=1,000. Subsequently, slices 2, 5 and 8, 11, 14, 17, 20, 23, 26, 29, 32 were acquired in the same way, and finally slices 3, 6 and 9, 12, 15, 18, 21, 24, 27, 30 as well. A single board-certified radiologist blinded to the clinical information assessed the outcomes for acute and chronic subdiaphragmatic visceral infarctions (SDVIs).

Statistical analyses

To compare baseline characteristics according to the presence of acute SDVIs, the Pearson's chi-square test or Fisher's exact test was used for categorical variables and the Student's t-test or Mann-Whitney U test for continuous variables, when appropriate. A multivariable logistic regression analysis with predefined variables (age and sex) and a bivariate analysis ($P \leq 0.25$) to assess potential confounders associated with SDVIs were performed to predict coexisting SDVI. Significance levels were set at $P<0.05$ for two-tailed tests. All statistical analyses were performed using SPSS version 19.0 (IBM Co., Armonk, NY, USA).