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The Second Affiliated Hospital of Air Force Medical University

Science and Technology Innovation Development Fund

Study Protocol

Protocol Title: Integrated image strategy of head and neck CTA combined with multimodal MRI to assess the risk of cerebrovascular disease

Principal Institute: Tang Du Hospital

The Second Affiliated Hospital of Air Force Medical University

Study Protocol

Objects:

Patients with suspected carotid artery stenosis who received CTA examination were selected from the outpatient department of neurology and ward of our hospital

1. Inclusion criteria: No neurological symptoms associated with carotid artery stenosis or tia (50 people in each group, 25 men and 25 women).

Mild stenosis group: CTA indicated carotid artery stenosis < 30%;

Moderate stenosis group: CTA indicated 30-69% carotid stenosis;

Severe stenosis group: CTA indicated carotid artery stenosis ≥70%;

Healthy control group: Suspected stiff artery stenosis was examined by CTA without definite stenosis;

No definite stenosis was observed via MRA and/or transcranial Doppler (TCD);

2. Exclusion criteria :1) Dementia, MMSE score < 21;

2) Previous symptoms of carotid artery stenosis or transient ischemic attack;

3) Other craniocerebral lesions, such as craniocerebral trauma, tumor, inflammation, macrovascular complications (cerebral infarction or cerebral softening foci);

4) Contraindications for MRI examination;

5) Have recently taken psychoactive drugs or hormones.

3. Lifestyle assessment: Subjects' intake of staple food (grams per day), smoking status (cigarettes per day), drinking status (two days), tea drinking habits, exercise status (frequency/week, duration/time), nap and night sleep status (duration, whether or not they snored) were collected in the last three months.

4. Clinically relevant information collection: age, sex, years of education, blood lipids (plasma total cholesterol, triglycerides), blood pressure, blood glucose (fasting blood glucose, glycosylated hemoglobin), body mass index (BMI), waist-to-hip ratio (WHR), and medication status (medication name, frequency, dosage/time, use method).

Cognitive assessment:

1. Montrier Cognitive Assessment Scale (MoCA) was used to evaluate the cognitive function of the subjects in different dimensions;

2. California Word Learning Scale (CVLT) test, Wisconsin (WCST) card test and Stroop word test were used to observe the subjects' memory ability and executive ability.

Neuroimaging examination:

Equipment: GE Discovery MR750 3.0T superconducting MRI, using 8-channel phased array head coil.

1) Conventional sequences: T2WI, FLAIR and DWI sequences to

exclude other organic lesions.

2) 3D BRAVO sequence: TE = 3.2 ms, TR=8.2 ms, TI= 450 ms, FA)=12°, FOV=256 ×256 mm2, matrix =256 ×256, layer thickness =1 mm, layer number = 188. Scanning time: 4 minutes and 10 seconds

3) 3D-Pcasl: TR 4632ms,TE 10.5ms,Arms 8, Points 512, PLD (Post Label Delay) 1525ms, layer thickness 4mm, layer spacing 0mm, a total of 72 cross-section images covered the whole brain.

4) RS-fmri: EPI sequence was used, TR 2000 ms; TE 30 ms; Turn Angle 90, layer thickness 4mm, no layer spacing; The matrix is 64 × 64, 180 time points are collected, and the scanning time is 7min.

5) DKI: Se-ss-dt-epi sequence was adopted. 3 B values (0, 1000, 2000 s/mm2) 10 b0 images, 25 diffusion gradient directions,TR/TE = 5800/77ms, FOV =256 × 256 mm2, matrix =128 × 128, layer thickness =2 mm, FA = 90°, layer number =48, In-plane spatial resolution = 2 × 2 mm2. Scanning time is 5 minutes and 54 seconds

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The data analysis

1. 3D-ASL data analysis: Perfusion weighted images obtained by 3D-ASL sequence scanning were passed

Reprocessing software included in GE's MR device generates CEREBRAL blood flow (CBF). Of CBF figure like into the line from the

line after the principle, by using SPM8 (http://www.filion.ucl.ac.uk) software based on voxel method (VBA) analysis. Each perfusion map was registered to the Montreal Neurologic Institute (MNI) standard brain space for intergroup comparisons. After spatial standardization, the image was resamped as 2 mm isotropic voxels, and a 6 mm half-height full-width (FWHM) Gaussian kernel was used for spatial smoothing to improve the image signal-to-noise ratio (SNR).

2. Rs-fmri data analysis: Data Processing using Data Processing Assistant for Resting State fMRI Adcanced Edition (DPARSFA, http://www.restfmri.net/forum/DPARSF) software for image preprocessing, including removal of top 10 point layer correction, head of nmo correction, time, space, standardized point, head of nmo correction (3 mm), and then the Data smoothing (FWHM) = 8 mm, to linear drift, Covariates (6 head motor parameters, average white matter signal, average whole brain signal, and average cerebrospinal fluid signal) were removed, and low-frequency filtering was performed (0.01 ~ 0.08Hz). WFU Pick Atlas Tool Version 3.0 software was used to select hippocampal regions of both cerebral hemispheres as seed points on the automatic anatomical marking template.