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Transcatheter aortic valve implantation improves cerebral blood flow and cognitive function in elderly patients with aortic stenosis -Brain perfusion SPECT imaging study-

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Topic(s):
Aortic Disease: Intervention

Citation:
Background: Cognitive impairment and depression are commonly noted in elderly frail patients with severe aortic stenosis (AS). However, their mechanisms and reversibility after treatment remain to be examined.

Purpose: In this study, we examined whether transcatheter aortic valve implantation (TAVI) increases cerebral blood flow (CBF) in cognitive/emotional brain areas, such as the hippocampus, in the elderly patients with severe AS.

Methods: We examined consecutive 15 right-handed patients with severe AS who were eligible for TAVI (median age 83.2 years, 12 (80%) women). We evaluated the following assessments both at baseline and 3 months after TAVI. Frailty was evaluated based on Fried scale, which consists of 5 items, including gait speed, cognitive function, weight loss, exhaustion, and inactivity. Frail and pre-frail were defined as greater than 3 and 1–2 in the scale, respectively. Cognitive and emotional status were evaluated with Logical Memory (LM) II, Mini Mental State Examination (MMSE), and geriatric depression scale (GDS). Lower LM II (less than 4 points) and MMSE (less than 24 points) and higher GDS (more than 6 points) indicate worse memory, general cognitive function, and depressive symptoms, respectively. CBF images were recorded with 99mTc single-photon emission computed tomography and were analyzed using SPM12. Briefly, CBF images were firstly normalized to the standard Montreal Neurological Institute space. Then, a voxel-wise parametric analysis was conducted between normalized CBF images at baseline and those after TAVI (P<0.005 at each voxel). Continuous variables were presented as mean ± standard error (SE). Normality was assessed using the Shapiro-Wilk test. Continuous variables were compared with the use of paired t test. Linear mixed-model analysis was performed to evaluate changes in neuropsychological tests and CBF over time.

Results: In the present study, all patients were not robust but pre-frail (47.3%) or frail (53.7%). LM II score was significantly improved at 3 months after TAVI compared with baseline (baseline, 8.7 vs. 3 months, 13.8, P<0.01) (Figure A), whereas no significant changes in MMSE or GDS scores were noted (baseline, 24.6 vs. 3 months, 25.2 for MMSE; baseline, 4.3 vs. 3 months, 4.2 for GDS). Importantly, although no patients showed clinical symptoms or signs for transient ischemic attack or stroke after TAVI, CBF in the local regions, including the right hippocampus, was significantly increased after TAVI compared with baseline (P<0.005 at each voxel) (green arrowheads) (Figure B). Furthermore, CBF in the right hippocampus were positively correlated with LM II scores (P=0.017) (Figure C).

Conclusions: These results provide the first evidence that TAVI improves cerebral perfusion (especially that in the hippocampus) and cognitive functions in elderly patients with severe AS.
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