3

Serial Cerebral Hemodynamic Change After Extracranial-Intracranial (EC-IC) Bypass Surgery: Evaluated by Acetazolamide Stress Brain Perfusion SPECT (Acz-SPECT).

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Purpose: We evaluated serial cerebral hemodynamic changes after EC-IC bypass surgery in symptomatic pts with atherosclerotic occlusion of internal carotid (ICA) or mid-cerebral artery (MCA) using Acz-SPECT. **Methods:** 25 symptomatic pts (M/F=19/6, 53±10 y) with ICA & MCA occlusion (16 uni- & 9 bilateral) prospectively underwent Acz-SPECT using Tc-99m ECD before and 1 week after EC-IC bypass surgery. Of these, 16 underwent additional f/u Acz-SPECT 5 mo later. Cerebral perfusion and perfusion reserve of MCA territory were evaluated visually and SPECT findings were classified into 4 groups: N/N; R/N; N/R; and R/R (perfusion/perfusion reserve; N=normal, R=reduced). For semiquantitative analysis, all SPECT images were normalized to MNI template and mean counts of MCA territory and cerebellum were obtained by AAL. Cerebral perfusion index ($PI=C_{region}/C_{cerebellum}$) and perfusion reserve index ($RI=(PI_{Acz}-PI_{basal})/PI_{basal}$) were calculated. **Results:** Preop SPECT findings of ipsilateral MCA in 25 pts were R/N (4%), N/R (12%), and R/R (84%). Early postop SPECT showed improvement of perfusion (26%) and/or reserve (68%) in ipsilateral MCA. Of 16 pts with 5mo f/u SPECT, 6 (38%) showed further improvement of perfusion or reserve. However, 4 (25%) showed aggravation of perfusion and one of these underwent revision surgery. Preop PI (1.1±0.1) and RI (0.11±0.07) of ipsilateral MCA were significantly lower than those of contralateral hemispheres ($p<0.05$). After surgery, PIs of bilateral MCA did not change at early postop period but improved in ipsilateral MCA at 5mo. RIs of ipsilateral MCA increased significantly (68%) at early postop period ($P<0.001$) and then did not changed. **Conclusion:** Cerebral perfusion and perfusion reserve changed with different manner during 5 mo after bypass surgery and perfusion reserve changed more dramatically than perfusion. Acz-SPECT is a feasible method for evaluating cerebral hemodynamic change after EC-IC bypass surgery.

4

Hemodynamic Outcome of Successful Bypass Surgery in Patients with Atherosclerotic Cerebrovascular Disease: A study with Acetazolamide and Tc-99m-ECD SPECT

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Purpose: The aim of the study is to evaluate the hemodynamic changes after successful bypass surgery in patients with atherosclerotic stenosis in ICA using Tc-99m-ECD SPECT. **Methods:** Fifteen patients (61±9 yrs) who underwent STA-MCA anastomosis for unilateral atherosclerotic cerebrovascular disease were enrolled. Tc-99m-ECD rest/acetazolamide perfusion SPECT was performed before, 10 days and 6 months after bypass surgery. Regional cerebral blood flow was scaled by normalizing to the mean cerebellar activity by 50. Perfusion reserve was defined as the % changes after acetazolamide over rest image. Resting cerebral blood flow and perfusion reserve were compared preoperative, postoperative 10 days (early-postoperative) and postoperative 6 months (late-postoperative) scans. **Results:** The mean resting perfusion and decrease in perfusion reserve in affected ICA territory on preoperative scan was 52.4±3.0 and -7.4±3.8%. The resting perfusion was significantly improved after surgery on early-postoperative scan (mean 54.2±1.8) and late-postoperative scan (53.8±2.3) compared with preoperative images ($p=0.004$, $p=0.04$, respectively). Resting perfusion did not showed further improvement on late-postoperative scan compared with early scan. The perfusion reserve was -3.0±2.6% on early-postopeprative scan, and -1.4±2.0% on late-postoperative scan, which was significantly improved after surgery. In addition, further improvement of perfusion reserved as observed on the scan taken 6 month after surgery ($p=0.02$ vs. early scan). **Conclusion:** The improvement of resting perfusion and perfusion reserve in early-postoperative scan reflects the immediate restoration of the cerebral blood flow by bypass surgery. In contrasts, further improvement of perfusion reserve showing on late postoperative scan may indicate a good collateral development after surgery, which may indicate good surgical outcome after surgery.