

## Cerebral blood flow abnormalities induced by transient hypothyroidism after thyroidectomy —Analysis by Tc-99m-HMPAO and SPM96—

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The current study is an investigation of alterations in regional cerebral blood flow (rCBF) distribution in patients with transient hypothyroidism after thyroidectomy. In addition, the effects of thyroxine treatment on rCBF changes were studied. **Methods:** Noninvasive rCBF measurements using <sup>99m</sup>Tc-HMPAO SPECT were performed on 24 post-thyroidectomy patients who were in a hypothyroidic state. The measurements were conducted before <sup>131</sup>I therapy and after thyroid hormone (thyroxine) replacement. We used adjusted rCBF images (normalization of global CBF for each subject to 50 ml/100 g/min with proportional scaling) to compare these data with age-matched normal control groups (n = 15) using SPM96. We also compared the absolute rCBF value of hypothyroidic patients with those of normal control groups. In addition, the association between rCBF alteration and the severity of depression was also analyzed. Finally, the effect of thyroid hormone replacement on rCBF was investigated individually using the Jack-knife test, in which patient data were compared with those from healthy volunteers. According to the result of this test, all cases were categorized into three subgroups, namely, improved, unchanged group and normal. To prove the reversibility of rCBF alteration after thyroid hormone replacement, a group comparison test between the normal controls and the improved group was done before and after thyroid hormone replacement. Similarly a group comparison test between the unchanged group and normal controls was also performed. **Results:** In the hypothyroidic condition, there was a significant decrease in the posterior part of the bilateral parietal lobes and in part of the bilateral occipital lobes, including the cuneus. These decreased rCBF areas extended to the bilateral prefrontal cortices as deterioration became more profound. On individual analysis, 16 of 24 patients (66.7%) demonstrated rCBF reduction, while 8 patient did not show significant rCBF change (33.3%, the normal group). After thyroxine replacement, improvement of rCBF was noted in nine of 16 patients (56.3%, the improved group). In seven of 16 patients (43.7% the unchanged group), the significant low rCBF area remained unchanged. Compared with the normal controls, the improved group showed significantly decreased rCBF of the bilateral parietal lobe and the occipital lobe in the hypothyroidic condition. After thyroid hormone replacement, these abnormal rCBF areas disappeared. In contrast, in the unchanged group, the significant hypoperfusion area became localized but remained. **Conclusion:** <sup>99m</sup>Tc-HMPAO SPECT and SPM96 analysis demonstrated a significant rCBF decrease in the parietal lobe and part of the occipital lobe in patients with induced transient hypothyroidism after thyroidectomy. This phenomenon might contribute to understanding of the depressive state. Recovery of rCBF after thyroid hormone replacement was confirmed in some patients. However, rCBF improvement did not always occur in every patient during the follow up period. The reversibility of rCBF in transient hypothyroidism may be dependent on individual characteristics during a short-term period.

**Key words:** <sup>99m</sup>Tc-HMPAO, regional cerebral blood flow, transient hypothyroidism, SPM96 (statistical parametric mapping), thyroxin replacement therapy, post-thyroidectomy