《招待講演 I》

Imaging Neuroreceptors in the Human Brain in Neuropsychiatric Disorders

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Nearly fifty years after the first measurement of thyroidal uptake of radioiodine to demonstrate decreased or increased function of the gland, it has become possible to assess the activity of neuroreceptors in the living human brain. Two important neurotransmitters in the brain are dopamine and serotonin. After considerable chemical research, the compound found to have the highest affinity for dopamine receptors is carbon-11 N-methyl spirperone. A related drug, spiperone, is used to treat schizophrenic patients in Japan. A similar drug, haloperidol, is used for that purpose in the United States. On May 25, 1983 we were able to carry out the first imaging of a neuroreceptor in a living human being, despite the fact that the dopamine receptor is present in only picomolar quantities within the caudate, nucleus and putamen. The Tracer permits assessment of the activity of serotonin as well as dopamine receptors because of their location in different parts of the brain. In studies of normal persons, we have found that there is a striking decrease in both dopamine and serotonin receptor activity with aging. In men between the ages of 20 and 70 years, there is approximately a 50% decrease in dopamine receptor activity. Serotonin receptor activity also decreases but to a lesser extent than dopamine receptors. Although our studies are still in progress, initial results strongly suggest that the decrease in both serotonin and dopamine receptor activity with age is much less striking in women that in men. We are investigating whether these findings are perhaps related to hormonal factors.

Other research in our laboratory is directed toward the questions of whether there are neuroreceptor abnormalities in patients with Alzheimer's, Parkinson's and Huntington's diseases, schizophrenia, tardive dyskinesia, Tourette's syndrome and depression. We are also planning to study patients with acute and chronic pain states with the new tracer, carbon-11 carfentanyl, which has a high affinity for opiate receptors, Animal studies have been completed and we are only awaiting approval of the Food and Drug Administration to carry out the first human studies.