Validation of the External IHSA Dilution Method for Measurement of Relative Changes in Cerebral Blood Flow in Rapid Succession

H. UEDA, S. HATANO, T. KOIDE and T. GONDAIRA

The Second Department of Internal Medicine, Faculty of Medicine, University of Tokyo, Tokyo

A method has been developed by us with which relative changes in cerebral blood flow can be determined in rapid succession. The purpose of the present investigation was to correlate the values with this method with those obtained by inert gas method, in order to ascertain its validity.

Study was made in 15 subjects with ages between 28 and 69 years. Four of them were patients with cerebrovascular disease, 3 with hypertension and the remaining 8 were without diseases affecting cardiovascular or nervous system.

Measurement of cerebral blood flow was made in recumbent position using the conventional N_2O desaturation method. Immediately thereafter, 40μc of IHSA in 0.5 ml of physiological saline was injected rapidly into a common carotid artery, and a dilution curve was recorded externally at the frontal area of the skull using a scintillation counter. The dilution curve showed a exponential downslope ($C=C_0e^{-Kt}$), of which the exponential coefficient K was determined graphically. A few minutes after injection of IHSA, radioactivity attained to an equilibrium, thereafter its changes by experimental procedures were postulated to indicate the changes in cranial blood volume. These measurements were repeated again during inhalation of 5 to 7% CO_2 or 85% O_2 in air. Relative changes in cerebral blood flow induced by the inhalation was calculated by multiplying the percent changes of K with changes in cranial blood volume.

Average increase in cerebral blood flow induced by CO_2 in 5 patients was 29.4% (19.0~35.5%) by IHSA method, showing a good agreement with N_2O method which demonstrated an increase of 32.6% on average (14.4~45.4%). Inhalation of 85% O_2 reduced cerebral blood flow in 3 patients ranging from −11.2 to −21.5% (mean −17.7%) by IHSA method, while corresponding values measured with inert gas ranged from −6.0 to −19.3% (mean −14.7%), again showing a good correlation in both methods. Cranial blood volume showed an average increase of 12% after CO_2 inhalation in 9 patients, and an average decrease of −9.2% after 85% O_2 inhalation in 6 subjects. These observations indicated that changes in cranial blood volume may play a significant role in changing K induced in our experimental procedures.

Validity of IHSA dilution methos for measurement of relative changes in cerebral blood flow was demonstrated in man. Correction of changes in K with changes in cranial blood volume was thought to be essential in this method.

The Study of Cerebral Hemodynamics with the Use of RI—Especially on the Mean Cranial Circulation Time when Vasopresso Drug and Cold Test were given

J. ATARASHI, M. YOSHIMURA, K. HARA, A. TERASHI, M. YAMATE, T. MIYAZAKI, T. KIKUCHI, H. IWASAKI and T. YAMANO

The Second Department of Internal Medicine, Nippon Medical School

We have already attempted to study the cerebral hemodynamics in cerebral vascular diseases under estimation of cerebral blood volume (CBV), mean cranial circulation time (MCCT) by the external tracing technique of isotope after direct injection into one of the

carotid arteries feeding the brain, particularly when various types of cerbral vasodilators were given.

Namely, after intravenous administration of nicotinic acid and 5% CO_2 inhalation the CBV increased but the MCCT was considerably shortened, and as a result increased the cerebral blood flow (CBF) was calculated in those cases.

After intravenous administration of theophyllin ethylendiamine the MCCT did not show any recognitionable changes but the CBV decreased slightly. In consequence, the CBF was calculated in slight decrement.

When amylnitrite was given for 20 seconds, the CBV increased rapidly after its inhalation and reached to the maximum in 1-2 minutes and returned gradually to the pre-inhalation level between 3-4 minutes. But the MCCT was prolonged inversely in 1-2 minutes, so the CBF decreased in those cases.

The present attempt was made to study the analysis of cerebral circulatory hemodynamics when vasopresor drug and cold pressure test were given. A comparative study was also made on the physiopathological difference between the MCCT of plasma with the use of RISA and the blood cell mean cerebral circulation time using ^{51}Cr-labelled erythrocytes.

When cold pressure test was given in cerebral vascular diseases, the blood pressure increased rather rapidly and reached to the maximum in 1-2 minutes. The MCCT was shortened in 1-minutes, then it gradually returned to the pre-test level in 3 minutes but the CBV showed decreasing in 1-2 minutes and thereafter it returned slowly to the pre-test level. As a result the CBF increased in 1 minutes and it returned to the pre-test level in 3 minutes but the CBV showed decreasing in 1-2 minutes and thereafter it returned slowly to the pre-test level. As a result the CBF increased in 1 minutes and it returned to the pre-test level in 3 minutes.

After intravenous administration of n-ethyl derivative of phenlyephrine (5 mg) in the cerebral vascular diseases, the CBV showed derivative of phenylephrine (5 mg) in the minimum value in 2 minutes, then it returned slowly to the pre-injection level but the MCCT was shortened in 1-3 minutes. In consequence the CBF increased in 1-2 minutes. In normal adults the MCCT was prolonged inversely and the CBV decreased in 1 minutes but those factors returned promptly to the pre-injection level.

VI. Blood

Studies on the Function Test of Salivary Gland with ^{131}I

T. Higashi
Kanagawa Dental College
K. Seki
Nippon Dental College

It is well known that the inorganic iodine is selectively picked up the by parotid gland and excreted into saliva.

Recently, we have made studies on the function of the parotid gland with iodine-131 that is administered to patients intravenously in the form of $Na^{131}I$.

The results obtained from the series of this study have been presented partly in the 4th annual meeting of Japanese Nuclear Medicine already.

This time, the function of the parotid gland was tested with this method in cases with tumor. The changes in the function after the