

Quantitative Estimation of ^{169}Yb -DTPA Cisternography Based on Urinary Excretion Measurement

K. WATANABE, K. KAWAHIRA, I. KAMOI and K. MATSUURA

Department of Radiology, Faculty of Medicine, Kyushu University, Fukuoka

Assessment of cerebrospinal fluid (CSF) dynamics by means of radioactive materials introduced into the subarachnoid space has been widely accepted. Although radionuclide cisternography can demonstrate the presence and the site of CSF flow disturbance, it is difficult to estimate the degree of CSF malabsorption only with the scintigraphic image.

It is well known that ^{169}Yb -DTPA is excreted to urine over 99% of administered dose within 24 hours after intravenous injection in the subjects with normal renal function. Because of this characteristics of ^{169}Yb -DTPA, the absorption of CSF may be quantitatively evaluated by measurement of urinary excretion of this substance following cisternography. We reported here the results of quantitative analysis of CSF dynamics based on the correlation between urinary excretion and scintigraphic images following cisternography with ^{169}Yb -DTPA.

Materials: 150 cisternographic examinations using radionuclide were performed in our department from 1970 to 1973. Of these cases, materials for this study were 57 cases, who were given ^{169}Yb -DTPA by intrathecal injection and collected whose total urine after the injection.

Method: 1 mCi of ^{169}Yb -DTPA was injected intrathecally. Anterior and lateral views were routinely obtained at 1, 3, 5, 24, 48 and 72 hours after the injection with scintillation camera (Nuclear Chicago, Pho/Gamma III). During 3 days following the injection, total urine was collected at time intervals of 24 hours. Excretion rate to

urine was calculated as the ratio of the activity in urine to the activity of injected ^{169}Yb -DTPA.

Results:

1. 57 cases were classified as follows according to the pattern of scintigraphic images; normal, 17 cases; ventricular filling, 19 cases; delayed absorption, only, 5 cases; asymmetric absorption, 4 cases; block in the spinal canal tract, 6 cases; leakage of CSF, 1 case; retention in meningocele, 2 cases and improper injection, 3 cases;.
2. The patients with these cisternographic patterns were analysed on the basis of urinary excretion rate of ^{169}Yb -DTPA following intrathecal injection. At 24 hours and 72 hours after the injection, normal subjects showed the urinary excretion of $66.8 \pm 12.2\%$ and $78.8\% \pm 9.7\%$. On the other hand, urinary excretion ratio in ventricular filling was $35.6 \pm 15.9\%$ and $48.2 \pm 16.2\%$; in delayed absorption $30.9 \pm 13.0\%$ and $51.0 \pm 5.6\%$; in asymmetric absorption $46.8 \pm 8.6\%$ and $71.3 \pm 12.6\%$; in block in the spinal tract $49.8 \pm 23.6\%$ and $60.9 \pm 21.9\%$.
3. In general, normal subjects excreted to urine over 50% of injected dose within 24 hours and over 70% within 72 hours. The patients with ventricular filling and the other abnormal patterns on scintigraphic images showed the decreased urinary excretion in comparison with normal subjects. However a few cases with abnormal scintigraphic pattern showed an almost normal urinary excretion rate. That

is probably due to the increase of CSF absorption in the area other than cerebral convexity.

4. The measurement of urinary excretion of ^{169}Yb —DTPA following intrathecal injection

for cisternography makes possible the quantitative estimation of CSF dynamics and is of value as an aid to the interpretation of cisternographic images.