IX. Gastro-Intestinal Tract

Perturbation in Inorganic Iodide Metabolism

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In order to clarify the effects of the alimentary tract on the metabolism of inorganic iodide, external counts were frequently studied of the forearm and the stomach region following intravenous injection of radioiodide.

Patients with various thyroid function who had been restricted from taking an iodide rich diet for two weeks before the test, were intravenously injected with carrier free ^{131}I Na solution (20-30 μCi). For about two days at intervals of from 30 to 60 minutes, counts of the forearm were measured with an arm counter (Packard Model 446 Armac Liquid Scintillation detector with Packard Model 3001 Tricarb Scintillation Spectrometer), and those of the stomach were obtained by collimating a probe (2″×2″ NaI crystal) on the stomach region. Before collimating the probe, the position of the stomach was determined on fluoroscopy. The counts thus obtained were plotted against time on a semilogarithmic paper.

In patients with a normal thyroid function, the counts of the forearm failed to show a smooth curve, but they revealed a wavy curve in close relation with mealtime.

Moreover the directions of the waves of forearm counts and those of the stomach region at a certain time were opposite. Thus it was inferred that concentration and secretion of iodide by the stomach and the salivary gland, and reabsorption by the intestine were never steadily performed but disturbed chiefly by mealtime.

Experimentally a pool of the alimentary tract was introduced into a steady compartment model, which consisted of three diffusion spaces, the thyroid gland and the kidney, and has been generally used in explaining iodide metabolism.

Here, the pool was made so that its volume CM might be the function of time CM(t). Next, counts of the forearm were simulated with an analogue computer by changing CM(t) into sine or rectangular wave. On an average these simulated counts decreased more rapidly unrelated with the form of CM(t) than simulated counts on an assumption that the whole system changed in steady state. It has been disclosed that mean clearance rates with which iodide enters the thyroid gland and the urine are increased. The present results do not seem to be fully explained with a conventional compartment model which ignores disturbing effects of the alimentary tract, taking it for granted that iodide metabolism keeps a steady state.

1. Conventional peeling method to measure iodide spaces is generally inadequate, because of perturbation in iodide metabolism by alimentary tract. (But thyroid gland of a patient with remarkable hyperthyroid function suffers little disturbance from perturbation by alimentary tract.)
2. Iodide clearances of thyroid gland, kidney, sweat gland, mammary gland and fetus are increased with perturbation chiefly by alimentary tract.