

## A method for the quantification of benzodiazepine receptors by using $^{123}\text{I}$ -iomazenil and SPECT with one scan and one blood sampling

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Iodine-123-iomazenil (Iomazenil) is a ligand of central type benzodiazepine receptors for single photon emission computed tomography (SPECT). Previously we reported a simple, table look-up method for quantification of its binding potential (BP) by using two SPECT scans and calibrated standard input function with one blood sampling. This method is based on a two-compartment model ( $K_1$ : influx rate constant;  $k_2$ : efflux rate constant;  $V_d (= K_1/k_2)$ : the total distribution volume corresponding BP), and requires two SPECT scans for calculating both  $K_1$  and  $V_d$  values. If the  $K_1$  value in the two-compartment model can be assumed to be constant, the radioactivity of one SPECT scan at 180 min after injection can be considered to tabulate as a function of  $V_d$  for a given  $K_1$  value and a given input function, and a table look-up procedure provides the corresponding  $V_d$  value. The purpose of this study was to develop a simple, autoradiographic method for quantification of BP by using one SPECT scan and calibrated standard input function with one blood sampling. SPECT studies were performed on 14 patients. A dynamic SPECT scan was initiated following an intravenous bolus injection of Iomazenil. A static SPECT scan was performed at 180 min after the injection. Frequent blood sampling from the brachial artery was performed on all subjects to determine the arterial input function. Simulation studies revealed that errors in calculated  $V_d$  values were around  $\pm 10$ –15% for varied  $K_1$  values. A good correlation was observed between total distribution volume values calculated by three-compartment model analysis and those calculated by the present method ( $r = 0.90$ ), supporting the validity of this method. The present method is simple and applicable for clinical use, and will be able to provide images of BP.

**Key words:** iodine-123-iomazenil, SPECT, benzodiazepine receptor, brain