

¹⁶⁹Yb-DTPA CISTERNOGRAPHY: HOW MANY RADS DOES THE BRAIN RECEIVE?

Ytterbium-169-DTPA is being widely used in clinical nuclear medicine for radionuclide cisternography. In a recent article, Barbizet, et al (1) claimed that the radiation exposure to the brain from intrathecally administered ¹⁶⁹Yb-DTPA was 1,500 rads. The calculations of radiation exposure for ¹⁶⁹Yb-DTPA cisternography presented by Wagner, et al (2) and by the 3M Company (3), however, place the exposure in the range of 0.02–0.07 rad/mCi whole body, 12–14 rad/mCi to the spinal cord (3M), and 1.1 rad/mCi to the brain (3M), assuming normal renal function and normal resorption from the cerebrospinal fluid.

Barbizet states that the intrathecally injected ¹⁶⁹Yb-DTPA is not entirely resorbed and excreted but adheres to the meningoencephalic structures. Because of the 32-day physical half-life, it follows that the brain would be exposed to prolonged irradiation. The 3M Company postulates, however, that these authors had free ¹⁶⁹YbCl₃, which adheres to "neural" tissues, contaminating the ¹⁶⁹Yb-DTPA. To study the ¹⁶⁹Yb-DTPA used in our department, we performed a chromatographic examination using the solvent system as described by Kovach (4). Chromatography failed to show any free ytterbium contamination.

In order to check further the disparity in the reported values of radiation-absorbed dose to the brain, a few patients, previously studied with ¹⁶⁹Yb-DTPA cisternography, were reimaged without administration of more radiopharmaceutical. The results of those examinations are described in Table 1. In varying periods up to 38 days after the intrathecal administration of hyperbaric ¹⁶⁹Yb-DTPA, we de-

tected 3.8–11.4% residual activity (not corrected for decay) in the head compared with the counts seen at 24 hr. Patients 2 and 3 showed normal CSF dynamics with minimal transient ventricular penetration by the radioisotope.

We do not understand why radioactivity was still present 1 month after intrathecal administration of the ¹⁶⁹Yb-DTPA. In light of our findings and the report of Barbizet, as physicians in nuclear medicine we have an obligation to do further investigations to determine carefully the expected residual activity of ¹⁶⁹Yb-DTPA in patients and to reevaluate the radiation exposure calculations for intrathecal administration.

NAOMI ALAZRAKI
 SHELDON HURWITZ
 SAMUEL E. HALPERN
 WILLIAM L. ASHBURN
 V.A. Hospital
 San Diego, California

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TABLE 1. RESULTS OF REIMAGING UP TO 38 DAYS AFTER ADMINISTRATION OF ¹⁶⁹Yb-DTPA

Patient	Indication for cisternogram	Results of cisternogram	Results of pneumoencephalogram	% Activity remaining in head compared with 24-hr activity (not corrected for decay)
1	Dementia	Consistent with normal pressure hydrocephalus	Consistent with normal pressure hydrocephalus	11.3% at 30 days
2	Personality change and mild dementia	Normal CSF dynamics except for transient ventricular penetration	Not done	3.8% at 38 days
3	Evaluation for post-traumatic hydrocephalus	Normal CSF dynamics except for transient ventricular penetration	Not done	11.4% at 6 days