EFFECT OF TRACER DOSES OF ^{131}I ON SERUM PROTEIN-BOUND IODINE AND SERUM THYROXINE CONCENTRATION

Apostolos G. Vagenakis, Cynthia M. Abreau, and Lewis E. Braverman

St. Elizabeth's Hospital and Tufts University School of Medicine, Boston, Massachusetts

Tracer doses of ^{131}I are commonly used in evaluating thyroid function and in scanning the thyroid gland. The amount of radioiodine used in these studies is extremely variable, but with modern detecting instruments it is unlikely that more than 60 μCi ^{131}I will be used. Significant radiation damage probably does not occur from these small doses. It would therefore be unlikely that these tracer amounts of ^{131}I would alter the secretion of thyroid hormone into the blood. However, a recent report has suggested that doses of 40 μCi carrier-free ^{131}I were followed by a significant lowering of the serum protein-bound iodine (PBI) within 48 hr (*1*). It was suggested that an early and transitory effect of irradiation to the thyroid resulted in a decreased secretion of thyroid hormone. More recently, Bell and Mackey did not confirm these findings but used only 20 μCi ^{131}I (*2*). In view of these contradictory findings, a study was carried out in which the effect of the administration of varying tracer doses of ^{131}I on the serum concentration of stable thyroid hormone was assessed.

METHODS

Studies were carried out in patients referred to the Nuclear Medicine Laboratory for studies of thyroid function. Two dose ranges of ^{131}I were used. In those patients in whom an ^{131}I uptake was requested, the dose of ^{131}I was 15–20 μCi and in those patients in whom thyroid scans were requested, 45–60 μCi were used. Blood was drawn before administration of the ^{131}I and 48 hr later. Both samples of serum were analyzed simultaneously in duplicate for stable PBI by a modification of the method of Zak (*3*) and for thyroxine iodine (T_4I) by a modification of the isotopic displacement technique of Murphy and Pattee (*4,5*).

RESULTS

The results obtained in 26 patients are summarized in Table 1. Fourteen patients were studied with the lower dose of ^{131}I. In these subjects, three of whom were hyperthyroid, no significant change occurred in either the serum PBI or T_4I following the administration of ^{131}I. Twelve patients, two of whom were hyperthyroid, were studied following the administration of the higher dose of 45–60 μCi ^{131}I. Again, no significant change in serum PBI or T_4I followed the administration of this higher dose of ^{131}I.

Received May 20, 1971; original accepted May 26, 1971.

For reprints contact: Lewis E. Braverman, Endocrinology Div., St. Elizabeth's Hospital, 736 Cambridge St., Boston, Mass. 02135.

TABLE 1. EFFECT OF TRACER DOSES OF ^{131}I ON SERUM PBI AND T_4I CONCENTRATION

	Serum PBI (μg/100 cc)			Serum T_4I (μg/100 cc)		
Dose ^{131}I (μCi)	Control	48 hr post ^{131}I	p value*	Control	48 hr post ^{131}I	p value
15–20 (14)†	6.2 ± 2.6‡	6.0 ± 3.2	NS	5.8 ± 2.1	5.7 ± 2.3	NS
45–60 (12)	6.7 ± 3.1	7.0 ± 3.7	NS	6.2 ± 3.1	6.4 ± 3.2	NS

* Paired t test.
† Number of patients in each group.
‡ ± s.d.

DISCUSSION

The administration of ^{131}I in tracer doses of 15–60 μCi does not effect the serum PBI or serum T_4I. These findings are not unexpected since this low radiation dose delivered to the thyroid would not be expected to alter thyroid trapping of iodide, thyroid hormone synthesis, or release of thyroid hormones into the blood. Our results are in agreement with those obtained by Bell and Mackay (*2*) but not with those obtained by Diengott and Boxer who reported a striking decrease in serum PBI following the administration of tracer doses of 40 μCi ^{131}I (*1*). Since the dose range of ^{131}I used in the present study encompasses both doses employed in the two previous studies, the radiation dose delivered to the thyroid cannot be the explanation for the divergent results found in the two previous studies.

Finally, since measurement of serum T_4I by the isotopic displacement technique requires the use of either ^{125}I- or ^{131}I-labeled thyroxine, it is suggested that the radioactivity in serum following the administration of tracer doses and, more importantly, therapeutic doses of ^{131}I be determined before the test procedure.

ACKNOWLEDGMENT

Supported in part by research grant AM 07917 from the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Bethesda, Maryland.

REFERENCES

1. DIENGOTT D, BOXER J: The influence of tracer doses of radio-iodine on the level of protein-bound iodine in serum. *Clin Chem Acta* 14: 199–200, 1966

2. BELL TK, MACKAY JS: Effect of 20 μC ^{131}I doses on protein-bound iodine concentrations in serum. *J Nucl Med* 9: 263, 1958

3. BENOTTI J, BENOTTI N: Protein-bound iodine, total iodine, and tubanol-extractable iodine by partial automation. *Clin Chem* 9: 408–416, 1963

4. MURPHY BEP, PATTEE CJ: Determination of thyroxine utilizing the property of protein-binding. *J Clin Endocr* 24: 187–196, 1964

5. BRAVERMAN LE, VAGENAKIS AG, FOSTER AE, et al: Evaluation of a simplified technique for the specific measurement of serum thyroxine concentration. *J Clin Endocr* 32: 497–502, 1971