EFFECT OF TRACER DOESES OF $^{131}$I ON SERUM PROTEIN-BOUND IODINE
AND SERUM THYROIDINE CONCENTRATION

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Tracer doses of $^{131}$I are commonly used in evaluating thyroid function and in scanning the thyroid gland. The amount of radiiodine used in these studies is extremely variable, but with modern detecting instruments it is unlikely that more than 60 $\mu$Ci $^{131}$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 $\mu$Ci 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 $\mu$Ci $^{131}$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 $\mu$Ci and in those patients in whom thyroid scans were requested, 45–60 $\mu$Ci 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,I) 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,I 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 $\mu$Ci $^{131}$I. Again, no significant change in serum PBI or T,I followed the administration of this higher dose of $^{131}$I.

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| TABLE 1. EFFECT OF TRACER DOESES OF $^{131}$I ON SERUM PBI AND T,I CONCENTRATION |
|-----------------------------------|------------------|------------------|------------------|------------------|------------------|
| Dose $^{131}$I ($\mu$Ci)          | Serum PBI (mg/100 cc) | 48 hr post $^{131}$I | p value* | Serum T,I (mg/100 cc) | 48 hr post $^{131}$I | p value* |
| 15–20 (14)                       | Control          | 6.2 ± 2.6*       | 6.0 ± 3.2      | NS               | Control         | 5.8 ± 2.1       | 5.7 ± 2.3      | NS               |
| (45–60)                          | 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 $\mu$Ci does not effect the serum PBI or serum T, I. 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 $\mu$Ci $^{131}$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, I 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.

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REFERENCES