# OPTIMIZING THE DOSE OF <sup>131</sup>I CURES HYPERTHYOIDISM WITHOUT CAUSING HYPOTHYROIDISM

Chen DY, Schneider PF, Zhang XS, He ZM, Jing J, Chen TH. **Striving for euthyroidism** in radioiodine therapy of Graves' disease: a 12-year prospective, randomized, open-label blinded end point study. Thyroid 2011;21:647-54. Epub May 12, 2011.

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## BACKGROUND

In China, the prevalence of hyperthyroidism is 3%; 90% of these cases are due to Graves' disease. Treatment with radioactive iodine (<sup>131</sup>I) for Graves' disease is becoming increasingly common in China. In the rural areas where most of the population reside, lifelong treatment with levothyroxine is difficult. The purpose of this study was to optimize the dose of <sup>131</sup>I in order to achieve a cure of the hyperthyroidism with a low rate of hypothyroidism.

#### **METHODS**

This is a 12-year prospective, randomized study. Six hundred patients who had Graves' disease and were older than 8 years of age participated. They were newly diagnosed patients on antithyroid drugs (ATDs) or those who had a history of taking the drugs; thyroid tests indicated hyperthyroidism, and thyroid uptake had to be greater than 40% while not taking antithyroid drugs. The patients were randomly assigned to one of five groups that received activities of 0.37, 1.11, 1.85, 2.56, and 3.33 MBq per gram of thyroid tissue adjusted for the 24-hour thyroid uptake (1 MBq = 0.027 mCi). However, the dose was also adjusted based on a scoring system for six clinical factors. Scores were rated as 0, 1, or 2 for the following factors: gland texture (soft, moderate, or hard), course of disease (<6 months, 6 months to 2

years, and >2 years), previous ATD (none, <2 years, or >2 years), state of disease (mild, moderate, or severe), complications (none, moderate, or severe), and age (<14 years, 14 to 18 years, and >18 years). Total scores ranged from 0 to 12, with an increase of 0.37 MBq per score of 2. Gland weight was estimated by ultrasound.

Clinical

THYROIDOLOGY

After the administration of <sup>131</sup>I, patients received propranolol, if necessary, and ATD, which was withdrawn 3 days before the follow-up visit.

#### RESULTS

A total of 529 patients completed the study. The mean age was approximately 35 years, three fourths were women, the mean gland weight was about 60 g, and the mean 24-hour uptake was about 65%. The optimal result was achieved in group 3. Based on the clinical factors, the dose was increased from 1.85 to 2.61 MBq/g with a broad range of 37 to 833 MBq/g. The mean (±SD) dose for the group was 261±162 MBq (7.05±4.39 mCi). In this group, 72% maintained a euthyroid state, 6% remained hyperthyroid, and 22% became hypothyroid, but 14% had recurrences during the 12-year follow-up.

#### **CONCLUSIONS**

The treatment protocol was effective for treating hyperthyroidism with a relatively low rate of hypothyroidism in the 12-year follow-up.

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Many years ago, attempts were made to provide exactly the right dose of <sup>131</sup>I to cure hyperthyroidism without causing hypothyroidism or requiring repeated doses of <sup>131</sup>I. Because cure without the complication of hypothyroidism was so infrequent, the recent approach has been to give a relatively large dose within the range of 100 to 200  $\mu$ Ci/g thyroid corrected for the 24-hour thyroid uptake (1). Some nuclear medicine units use arbitrary doses of 10 to 15 mCi, while others aim for 160  $\mu$ Ci/g. With this approach, the treatment has been called "ablation," because hypothyroidism is so often the outcome. I have nearly given up on correcting our fellows and *continued on next page* 

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residents who call radioiodine treatment of Graves' hyperthyroidism "thyroid ablation" rather than "treatment"; ablation implies that hypothyroidism is inevitable, whereas "treatment" leaves the possibility that there may be an outcome of euthyroidism.

The clinical features used for optimizing the dose in the current study may be somewhat arbitrary, such as determining the texture of the gland or the duration of the disease. Nevertheless, within the 12 years of follow-up, the results are impressive. Unfortunately, the history of radioiodine therapy in the United States and Europe makes me suspect that the good outcome will not persist as the patients are followed longer. Sridama et al. at the University of Chicago tried a low-dose program to cure hyperthyroidism many years ago and still found that the incidence of hypothyroidism at 12 years of follow-up was 73% (2). Many other reports showed that the incidence of hypothyroidism tended to increase at a rate of 2% to 4% per year after 10 years, leading to the conclusion that hypothyroidism eventually develops in nearly all patients after <sup>131</sup>I therapy for Graves' disease. However, my personal experience shows otherwise. Some patients are euthyroid in long-term follow-up.

However, a study of 1086 patients with Graves' disease treated with <sup>131</sup>I in Finland using a dose similar to that used in group 3 of the study under discussion, 7 mCi, found an incidence of 59% hypothyroidism at 10 years and 82% at 25 years (3). Perhaps paying attention to the clinical factors cited in the study under discussion will improve this result. I am optimistic.

### - Jerome M. Hershman, MD

### References

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