More Foci of Thyroid Cancer Metastases Are Identified by Thyroid Hormone Withdrawal than by Use of Recombinant Human TSH

Van Nostrand D, Khorjekar GR, O'Neil J, Moreau S, Atkins FB, Kharazi P, Mete M, Chennupati SP, Burman KD, Wartofsky L. Recombinant human thyroid-stimulating hormone versus thyroid hormone withdrawal in the identification of metastasis in differentiated thyroid cancer with ¹³¹I planar whole-body imaging and ¹²⁴I PET. J Nucl Med. 2012;53:359-62. Epub February 7, 2012.

SUMMARY • • • •

Background

Recombinant human TSH is approved for diagnostic studies of recurrent thyroid cancer and for preparation for radioiodine ablation of thyroid remnants after thyroidectomy. In some patients with metastatic disease, it has been used as preparation for therapy with ¹³¹I, but there have been no studies of its efficacy compared with that of thyroid hormone withdrawal in a substantial number of patients. The purpose of this study was to compare these two methods of preparation for detection of metastatic foci in patients with a high suspicion of metastatic differentiated thyroid cancer (DTC).

Methods

During the period 2006–2010, patients at the Washington Hospital Center who had high suspicion of recurrent or metastatic DTC, based on an enlarging mass or elevated serum Tg, who were candidates for ¹³¹I therapy were prepared with either thyroid hormone withdrawal (THW) or two injections of 0.9 mg rhTSH. Patients were eating low-iodine diets for 2 weeks, including the time of testing. All patients underwent ¹³¹I whole-body scans 48 hours after

receiving 2 mCi ¹³¹I and ¹²⁴I PET/CT scans 48 hours after receiving 1.7 mCi ¹²⁴I. All foci of uptake were categorized by two physicians as physiologic uptake, artifact, or positive for functioning metastases.

Results

Forty patients were evaluated; 24 were prepared with rhTSH and 16 with THW. The mean age, serum Tg, type of cancer, and previous ¹³¹I doses (usually 2) and total gigabecquerels of ¹³¹I did not differ between the two groups. One of 24 patients (4%) had positive foci detected on rhTSH ¹³¹I scans, and 10 of 16 (63%) had positive foci detected on THW ¹³¹I scans (P<0.02). The number of positive foci detected on the rhTSH ¹³¹I and THW ¹³¹I scans were 2 and 58, respectively (P<0.05). Seven of 24 patients (29%) had positive foci detected on rhTSH ¹²⁴I scans, and 10 of 16 (63%) had positive foci detected on THW ¹²⁴I scans (P<0.03). The number of positive foci detected on the rhTSH ¹²⁴I and THW ¹²⁴I scans were 17 and 117, respectively (P<0.03).

Conclusions

Significantly more foci of DTC metastases can be identified in patients prepared with THW than in patients prepared with rhTSH.

ANALYSIS AND COMMENTARY • • • • •

This study corroborates the concept that more sustained elevation of serum TSH is necessary to activate the uptake of radioiodine in DTC tissue as compared with the amount of TSH needed for activating normal thyroid tissue. Although the levels of

elevated TSH after injection of recombinant TSH are substantial and persist for several days, the pharmacodynamic area under the TSH curve is likely to be much less than that achieved after withdrawal of thyroid hormone for 2 weeks in the case of T₃ or 4 to 6 six weeks in the case of T₄ withdrawal. Aside continued on next page





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from economic considerations, it would be preferable to use rhTSH in order to avoid symptomatic hypothyroidism. However, this is worthwhile only if the stimulation of rhTSH is effective for activation of thyroid uptake in metastatic tissue. By two methods, this study showed that rhTSH is much less effective than thyroid hormone withdrawal. In a study of lesion dosimetry using ¹²³I in 4 patients with metastatic DTC, Pötzi et al reported that all patients had lesser uptake of ¹²³I under rhTSH stimulation than after hormone withdrawal (1), in agreement with the results of this study.

One criticism of the study is that it was not randomized, although demographic and clinical data in the two groups were very similar. Another criticism is

that a tracer dose larger than 2 mCi might have been more effective in showing positive foci with the rhTSH preparation. One could also criticize it because there were no outcome data with regard to the efficacy of radioiodine therapy for elimination of metastases. However, uptake of tracer radioiodine is essential to determine the need for subsequent ¹³¹I therapeutic doses.

The study reinforces my practice of using thyroid hormone withdrawal, rather than rhTSH, for preparation for radioiodine scans when there is a strong suspicion of recurrent disease; the withdrawal also prepares the patient for the therapeutic dose.

- Jerome M. Hershman, MD

Reference

1. Pötzi C, Moameni A, Karanikas G, et al. Comparison of iodine uptake in tumour and nontumour tissue under thyroid hormone deprivation and with recombinant human thyrotropin in thyroid cancer patients. Clin Endocrinol (Oxf) 2006;65:519-23.