Post ¹³¹I carcinoma of the thyroid

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Summary: A case of post-radioiodine follicular carcinoma of the thyroid is presented. Current evidence suggests no causal relationship. The evidence for this assertion is reviewed with the conclusion that a note of caution is still required.

Introduction

There is an increased risk of carcinoma of the thyroid arising 20 years or more after external irradiation of the head and neck, but not, apparently after treatment with ¹³¹I.^{1,2} We present a case of thyroid carcinoma arising 21 years after treatment with ¹³¹I, and discuss the evidence for the long term safety of ¹³¹I treatment.

Case report

In 1965 a 52 year-old woman was treated for thyrotoxicosis with a dose of 7 mCi of ¹³¹I. In 1986 she developed an irregular hard lump in the right lobe of the thyroid. There was no cervical lymph adenopathy and no vocal cord palsy. She was euthyroid and no thyroid autoantibodies were detected. Isotope scanning confirmed a cold nodule in the right lobe of the thyroid. Total thyroidectomy was performed. Histology showed a well differentiated follicular carcinoma infiltrating the capsule and skeletal muscle (Figure 1). In addition to the main tumour in the right lobe a focus of similar tumour was seen in the left lobe. A post-operative scan showed residual uptake and therefore an ablative dose of 79 mCi of ¹³¹I was given. The patient remains well and free of recurrent carcinoma 3 years later.

Discussion

An association between external radiation of the neck and subsequent carcinoma of the thyroid is well documented.^{1,3,4} The hallmark of radiation-induced carcinoma is a long latent period being 20 to 25 years in the case of thyroid carcinoma.⁵ In contrast, current evidence suggests that there is no

Figure 1 Section showing infiltrating follicular carcinoma of the thyroid. H & E. × 16.

increased risk of carcinoma following ¹³¹I treatment for thyrotoxicosis. However, published studies contain few patients followed for more than 20 years from treatment.

Dobyns *et al.*² reported on a cooperative study of 21,714 patients with an average follow-up of 8 years; 1,953 patients were followed to 15 years and 115 patients to 20 years. Of the 28 malignancies that developed in the thyroid gland all occurred less than 10 years after treatment. This study provides convincing evidence that the risk of carcinoma is very small up to 20 years from treatment.

A retrospective study was performed by Holm *et al.*⁶ in 1980. They analysed the incidence of carcinoma in patients who had received ¹³¹I compared with the incidence in non-irradiated individuals who were reported to the Swedish Cancer Registry. This agency has 97% of all cancers diagnosed in Sweden reported to it.⁶ Three thousand patients were treated with ¹³¹I and were followed for a mean period of 12.36 years. A total of 408 patients were followed for periods of over 20 years. Four cases of subsequent carcinoma, with a latent period of between 3 and 13 years were found. This was not

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significantly different from the 3.2 cases that were predicted on the basis of Swedish Cancer Registry figures.

Spencer *et al.*⁷ analysed 25 previously reported cases of carcinoma following ¹³¹I therapy. In 15 cases there were pre-existing thyroid nodules and in 8 cases the latent period was less than 5 years. They concluded that these cases did not provide evidence of an increased risk of thyroid carcinoma after ¹³¹I treatment.

It has been postulated that ¹³¹I may not carry the late cancer risk associated with external irradiation because of a different effect on the cells.^{6,8} The average dose to thyroid cells that are irradiated externally was calculated in Degroot's series⁵ to be 451 rads. Therapeutic ¹³¹I usually delivers between 4,000 and 8,000 rads to the follicular cells. The

higher dose causes cell death whereas the smaller dose may allow cell survival with subsequent mutation and malignant change.

The histological picture of radiation-induced thyroid cancer is usually papillary. However, in Spencer's review⁷ 6 of 24 tumours were follicular in type or had a significant follicular component so our case is not unique.

In the case reported here the latent interval of 21 years is consistent with the known features of radiation-induced cancer. Previous studies indicate a negligible risk up to 20 years. We suggest that the present evidence does not entirely exclude an increased cancer risk more than 20 years after treatment with ¹³¹I, and the implications of this are important in treatment choice for younger patients.

References

1. Duffy, B.J. Jr & Fitzgerald, P.J. Cancer of the thyroid in children: a report of 28 cases. *J Clin Endocrinol Metab* 1950, **10**: 1296–1308.
2. Dobyns, B.M., Sheline, G.E. & Workman, J.G. Malignant and benign neoplasms of the thyroid in patients treated for hyperthyroidism: A report of the Co-operative Thyrotoxicosis Study. *J Clin Endocrinol Metab* 1974, **38**: 976–998.
3. Maxon, H.R., Thomas, S.R., Saenger, E.L., Buncher, C.R. & Kereiakes, J.G. Ionising irradiation and the induction of clinically significant disease in the human thyroid gland. *Am J Med* 1977, **63**: 967–978.
4. Modan, B., Ron, E. & Werner, A. Thyroid cancer following scalp irradiation. *Radiology*, 1977, **123**: 741–744.
5. Degroot, L.J., Reilly, M., Pinnameneni, K. & Refetoff, S. Retrospective and prospective study of radiation induced thyroid disease. *Am J Med* 1983, **74**: 852–862.
6. Holm, L.E., Dahlquist, I., Israelsson, A. & Lundell, G. Malignant thyroid tumours after iodine-131 therapy. *N Engl J Med* 1980, **303**: 188–191.
7. Spencer, R.P., Chapman, C.N. & Rao, H. Thyroid carcinoma after radioiodine therapy for hyperthyroidism. *Clin Nucl Med* 1983, **8**: 216–219.
8. Nemec, J., Soumar, J., Zeman, V., Nahodil, I.V., Zamrazil, & Smejkal, V. Differentiated thyroid cancer following radioiodide I-131 therapy of hyperthyroidism – a case report. *Oncology* 1978, **35**: 277–280.