Post $^{131}$I 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 $^{131}$I. We present a case of thyroid carcinoma arising 21 years after treatment with $^{131}$I, and discuss the evidence for the long-term safety of $^{131}$I treatment.

Case report

In 1965 a 52 year-old woman was treated for thyrotoxicosis with a dose of 7 mCi of $^{131}$I. 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 $^{131}$I 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. The hallmark of radiation-induced carcinoma is a long latent period being 20 to 25 years in the case of thyroid carcinoma. In contrast, current evidence suggests that there is no increased risk of carcinoma following $^{131}$I treatment for thyrotoxicosis. However, published studies contain few patients followed for more than 20 years from treatment.

Dobyns et al. 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. in 1980. They analysed the incidence of carcinoma in patients who had received $^{131}$I 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. Three thousand patients were treated with $^{131}$I 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
significantly different from the 3.2 cases that were predicted on the basis of Swedish Cancer Registry figures.

Spencer et al.\textsuperscript{7} analysed 25 previously reported cases of carcinoma following \textsuperscript{131}I 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 \textsuperscript{131}I treatment.

It has been postulated that \textsuperscript{131}I may not carry the late cancer risk associated with external irradiation because of a different effect on the cells.\textsuperscript{6,8} The average dose to thyroid cells that are irradiated externally was calculated in Degroot’s series\textsuperscript{5} to be 451 rads. Therapeutic \textsuperscript{131}I 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 review\textsuperscript{7} 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 \textsuperscript{131}I, and the implications of this are important in treatment choice for younger patients.

References

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