Iodine-131 Therapy for Parotid Oncocytoma

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We present a rare case of a patient with coexisting parotid oncocytoma and chronic thyroiditis who received two therapeutic doses of [^{131}I]iodide for a recurrent oncocytoma (oxyphilic granular cell adenoma), resulting in a definite reduction in tumor volume. We suggest that radioiodine therapy for a recurrent oncocytoma is an effective form of tumor therapy.

J Nucl Med 29: 1126–1129, 1988

Toxic thyroid adenomas represent the only benign lesions of the thyroid which have been reported to have been treated with radioactive iodine therapy (*1–4*). Parotid oncocytoma, or oxyphilic granular cell adenoma, is an uncommon and benign tumor. It is known that the parotid oncocytomas, as well as Warthin's tumors, take up both radioiodine and pertechnetate because they originate from salivary duct epithelium (*5–9*).

We have encountered an unprecedented case of a patient who received a therapeutic dose of radioiodine for a recurrent, unresectable parotid oncocytoma which showed improvement following therapy.

CASE REPORT

First Admission (April 21, 1984)

A 69-yr-old female was admitted because of a tender nodule at the angle of the left mandible. Six years before entry she was told that she had chronic thyroiditis. Since then, she has been treated with Thyroid USP (dessicated thyroid), 200 mg daily, because of evidence of thyroid hypofunction.

Physical examination showed a mobile tumor measuring ~ 3 × 2 cm in the tail of the left parotid gland. At surgery, the facial nerve was firmly involved with the tumor and thus only partial resection of the mass was possible. The pathology report indicated that the tumor was an oxyphilic granular cell adenoma (oncocytoma). Figure 1 shows the histologic characteristics of the tumor.

Received Sept. 21, 1987; revision accepted Feb. 8, 1988.

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Second Admission (February 2, 1985)

From 3 mo prior to the second admission, the patient had complained of pain and swelling at the same site due to recurrence. Iodine-123 (^{123}I) scintigraphy revealed extrathyroidal accumulation in the recurrent left parotid mass. No activity was seen in the region of the thyroid gland. The recurrent tumor did not discharge ^{123}I on washout by lemon. The patient refused a second surgical procedure.

Iodine-131 Therapy

Before we tried a new approach of radioiodine therapy for the recurrent parotid oncocytoma, we studied the tumor uptake ratio of ^{123}I with different preparations which seemed to have an influence upon tumor retention time of radioiodine (Table 1). The counts in the tumor were compared with a standard of the administered dose; the percentage taken up by the tumor, the tumor uptake ratio, was then calculated. From the results, we selected the preparation of both iodine-depletion regimen and administration of anticholinergic drug in order to maximize tumor uptake and prolong tumor retention of radioiodine. She actually received an iodine-depletion regimen before and after the administration of a therapeutic dose of iodine-131 (^{131}I) for 14 days. She was also administered atropine sulphate, 2.4 mg a day, for 7 days after the administration of ^{131}I. The effective half-life of ^{131}I was 1.2 days. The effective half-life was determined by plotting the cpm of the tumor on a semilog graph paper, at 3 hr, 24 hr, and 7 days after the administration of ^{131}I.

We first aimed at delivering ~400 μCi per gram of estimated weight of the tumor. Therefore, at first she was administered 71.3 mCi of [^{131}I]sodium iodide. The estimated absorbed dose in the tumor was 39 Gy which was calculated on the basis of the Quimby's formula (*10,11*) (Fig. 2, Table 2). A slight reduction in the tumor volume was observed ~1 mo after the first administration of ^{131}I. Six months after the first treatment, we performed the second treatment with the dose of 249.7 mCi of ^{131}I. We believe that that dose is probably the maxi-

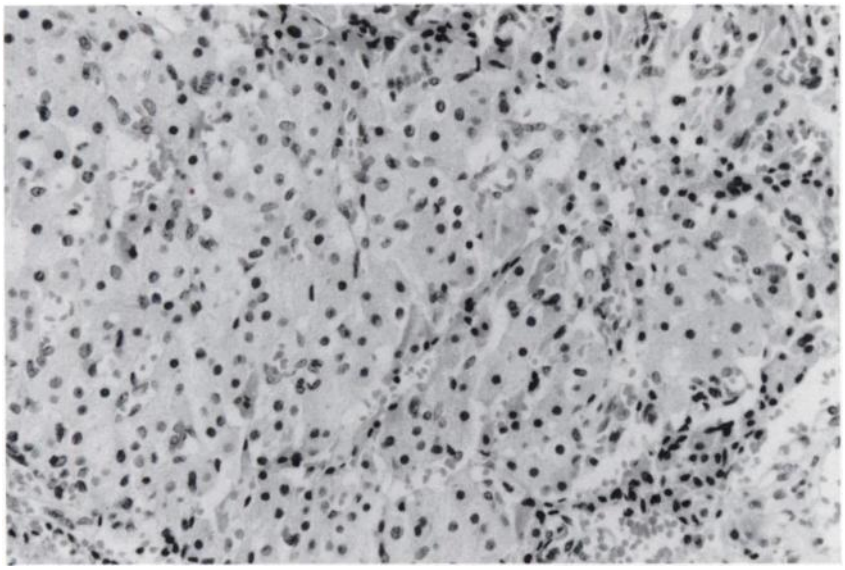

FIGURE 1
Histologic section with hematoxylin-eosin stain shows large cells with eosinophilic granular cytoplasm which is histologically characteristic picture in oncocytoma. The tumor cells show monomorphic pattern without malignant changes.

TABLE 1
Tumor Uptake of ^{123}I (%)

	3 hr	24 hr
No administration	5.2	2.2
Administration of potassium iodide for 7 days	1.6	0.3
Iodine-depletion regimen	6.8	3.0
Iodine-depletion regimen and administration of anticholinergic drugs	7.7	5.5

mum dose of ^{131}I that we can deliver at a time in safety. A definite reduction in the tumor volume was observed 1 mo after the second treatment which relieved the patient of her pain (Fig. 3 A, B, C, D). The estimated absorbed dose of the second treatment was 87.8 Gy (Table 2).

No acute thyroiditis was encountered, nor did the patient experience a sore throat or thyroid gland enlargement. Minor and temporary untoward responses were seen after the second treatment. She developed general malaise, anorexia, stomatitis, impairment of gustation, epigastralgia, leukopenia, thrombocytopenia, and anemia. The lowest white blood cell and platelet counts and lowest hemoglobin which were recorded, were 1,800/mm^3, 48,000/mm^3 and 9.6 g/100 ml, respectively. With the exception of a slightly dry mouth, all symptoms and signs disappeared within 1 to 3 mo.

DISCUSSION

Parotid oncocytoma is also called oxyphilic granular cell adenoma. It is an uncommon, benign tumor, accounting for no more than 1% of parotid tumors. The rare malignant oncocytoma known as an oxyphilic granular cell adenocarcinoma has been described in the salivary, thyroid, and adrenal gland (*12,13*).

Although the mechanism of hyperconcentration of radioiodine and pertechnetate in Warthin's tumor and oncocytoma is not known precisely, there is speculation

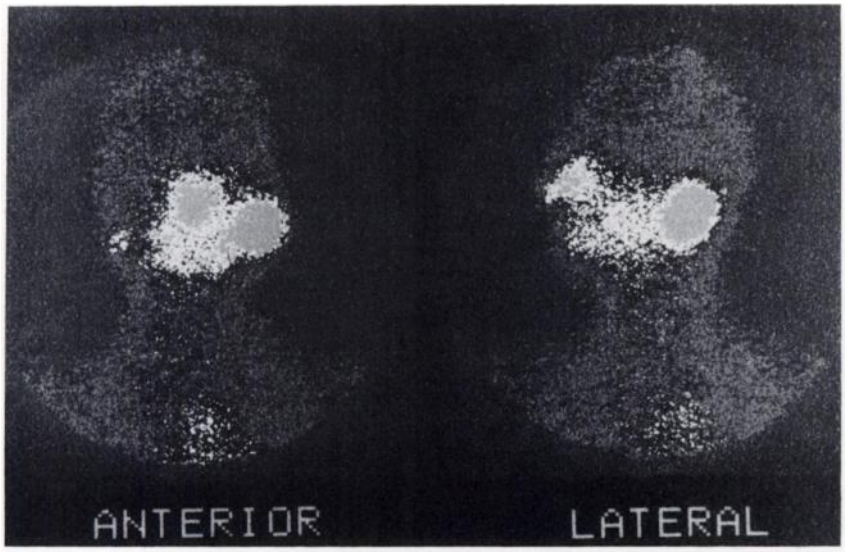

FIGURE 2
Twenty-four hours after the administration of 71.3 mCi of ^{131}I, there is an extrathyroidal accumulation of ^{131}I which is avidly trapped by the oncocytoma of the left parotid gland. No activity is seen in the region of the thyroid gland.

TABLE 2
Radiation Dose Calculation

	Dose (mCi)	Volume (cm^3)	Fraction of administered dose in tumor at 24 hr	Effective ^{131}I $t_{½}$ (days)	Gy
First treatment	71.3	12.3	2.90	1.20	39.0
Second treatment	249.7	11.3	1.47	1.35	87.8

that both radioiodine and pertechnetate are trapped by the tumor cells because they originate from salivary duct epithelium. The tracers cannot be secreted because of the lack of communication between the tumor cells and the duct systems.

Surgical excision is the treatment of choice for this tumor. With resection, prognosis is excellent. However, in the case where the tumor cannot be totally removed, recurrence is not uncommon. In our case, although the pathology report indicated a benign lesion, clinically, the tumor demonstrated a number of malignant characteristics such as facial nerve involvement and severe pain. The patient declined to undergo re-operation despite our repeated recommendation. The ^{123}I scintigraphy revealed a "hot spot" corresponding to the tumor and no accumulation of ^{123}I in the region of the thyroid gland on account of hypothyroidism. In addition, the patient fervently wanted medical treatment rather than surgical excision, so that we decided to try a new approach of radioiodine therapy for this recurrent tumor.

The patient required no ablation of the thyroid gland because she already had hypothyroidism from chronic thyroiditis treated with thyroid hormone for ~6 yr. The failure of thyroid uptake may be a consequence of both thyroiditis and administration of thyroid replacement.

The oncocytoma avidly took up radioiodine, but its retention time in the tumor was short and the tumor uptake of radioiodine was low, compared with that of toxic thyroid adenoma (*1–4*). The relatively short retention time by the tumor is presumably due to the fact that while it shows ^{131}I trapping, there is no organifica-

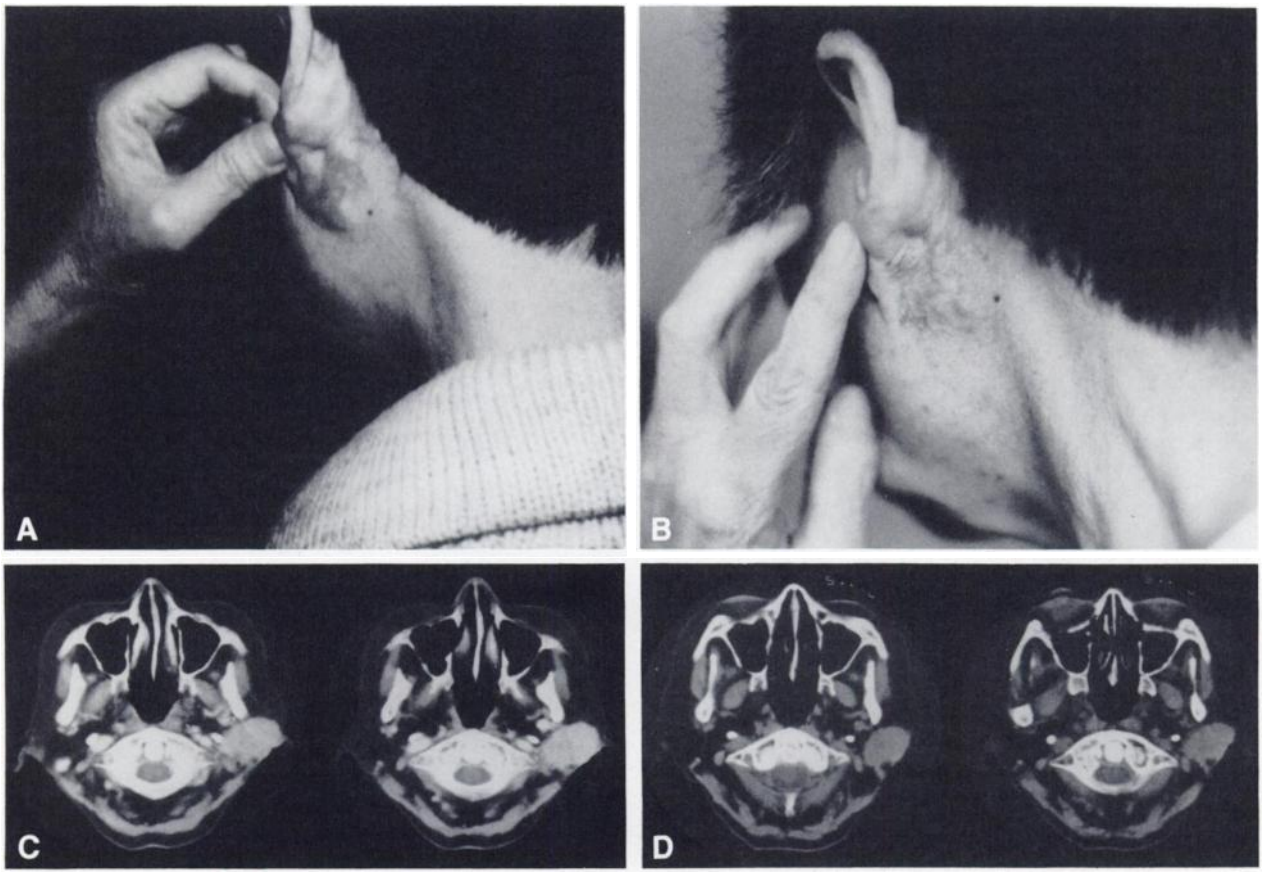

FIGURE 3
A: The film taken just before the first treatment of ^{131}I shows a protruding tumor in the region of the left parotid gland. B: The film taken 1 mo after the second treatment of ^{131}I shows that the tumor definitely became smaller in size. C: The TCT scan taken before the first treatment of ^{131}I shows a solid mass with a homogeneous density in the lower part of the left parotid gland. D: The TCT scan taken 3 wk after the second treatment shows the reduction of the tumor volume. The tumor volume was reduced from 12.3 cm^3 to 6.9 cm^3 (44% reduction in volume).

tion as is the case with thyroid adenomas which are able to synthesize thyroid hormones.

We prepared our patient by means of both an iodine-depletion regimen and administration of atropine sulphate which maximized tumor uptake and prolonged tumor retention of radioiodine (*14,15*). Although benign tumors are generally resistant to radiotherapy compared with malignant tumor, we first attempted to deliver ~400 μCi per gram of estimated weight of the tumor, about twice the dose employed for toxic multinodular goiter (*16*), regardless of what proportion of the tumor was functional.

Our goal was not to ablate the entire tumor but to decrease tumor size in hopes of relieving the patient of her pain. The tumor showed a 44% reduction in volume and although most oncological criteria require a 50% or greater reduction in tumor volume to claim partial response, our patient did exhibit subjective and objective benefits following radioiodine therapy.

The reduction in volume of this tumor required much larger doses of radioiodine than we employed, because of the low tumor uptake and the short effective half-life of ^{131}I. In toxic thyroid adenoma, Gorman and Robertson reported that the radiation dose from 15 mCi of ^{131}I within a 3-cm nodule would be 246 Gy (*17*). These calculations were based on a fixed 30% uptake and a 5-day effective half-life. In our case, a 44% tumor reduction was seen following an estimated dose of 87.8 Gy. Therefore, there is a strong possibility that the tumor received more than the estimated dose due to the fact that the mass showed numerous thin strands of fibrous connective tissue which divided it into lobes.

The safety of radioiodine therapy for benign parotid tumor may be questioned. We were unable to calculate the bone marrow absorbed dose from the radioiodine therapy. Only minor and temporary untoward responses were seen and they resolved within 1 to 3 mo except for slightly dry mouth. The leukopenia, thrombopenia and anemia which were recorded, were similar to the degree of myelosuppression typically encountered with the use of ^{131}I therapy for thyroid cancer. At 1 yr following therapy, the patient continues to do well. Our experience suggests, therefore, that radioiodine therapy for a recurrent oncocytoma can be an effective form of therapy for this tumor.

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