

# Three Cases of Differentiated Thyroid Carcinoma : The Efficacy of Radioiodine-131 Therapy

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## ABSTRACT

Three patients received radioiodine-131 therapy for distant metastases from differentiated thyroid carcinoma and long-term follow-up. All of them were females and their ages were 32, 36, and 61 years at the time of diagnosis. Histological diagnoses were two of papillary and one of follicular carcinoma. After the thyroid surgery, bone metastases occurred in Case 1, and lung metastases in Cases 2 and 3. Radioiodine therapy was effective in two cases (Cases 1 and 2), while it was not effective in Case 3 because of no uptake of iodine-131 in the metastatic lesions. The efficacy of radioiodine therapy depends on the tumor uptake and retention of radioiodine in the metastatic lesions.

## KEY WORDS

Radioiodine therapy,  $^{131}\text{I}$ , Differentiated thyroid carcinoma, Lung metastasis, Bone metastasis

## INTRODUCTION

Since Keston's first report on the usage of radioactive iodine as a therapeutic agent in 1942, radioiodine therapy for distant metastases from differentiated thyroid carcinoma has been performed<sup>1)</sup>. It is an unique method in treating malignant tumors and has some characters. Differing from external irradiation, iodine-131 ( $^{131}\text{I}$ ) irradiates the metastases from the inside out selectively. The ionization produced by the 609 KeV beta rays may be greater than from conventional X-ray therapy and is confined to a small area because the beta radiation penetrates only a few millimeters in tissue<sup>2)</sup>. Therefore, it is possible to destroy not only microscopic carcinoma in the residual thyroid tissue but also small distant

metastases.

In this report, three patients with lung or bone metastases from differentiated thyroid carcinoma are studied and the factors affecting radioiodine therapy are discussed.

## CASE REPORT

### Case 1

A 32 year-old female underwent partial lobectomy of the thyroid for follicular thyroid carcinoma. She had been free from disease for 20 years. At 52 years old she suddenly complained of severe pain around the right hip joint. X-ray CT showed a huge mass destroying the sacrum and the right iliac bone (Fig. 1). Bone scintigraphy with 740 MBq of  $^{99\text{m}}\text{Tc}$ -methylene-diphosphonate (MDP) showed intense uptake

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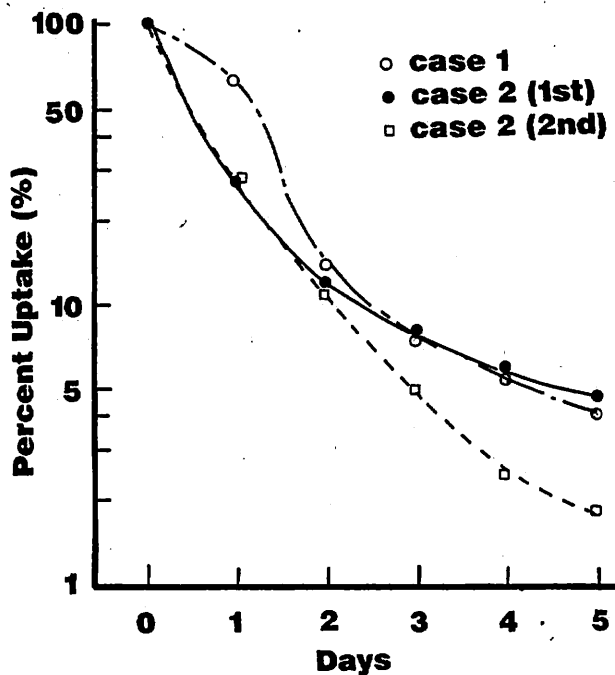
**Fig. 1** (Case 1) 52-year-old female with follicular thyroid carcinoma.

X-ray CT shows a huge low density mass destroying the sacrum and the right iliac bone.



**Fig. 2** A whole body scan with therapeutic dose of  $^{131}\text{I}$  shows abnormal uptake in the metastatic lesions.

in the sacrum and the right hip joint suggesting bone metastases. Iliac bone biopsy confirmed the diagnosis of bone metastasis from follicular thyroid carcinoma. Following the total thyroidectomy to ablate thyroid remnants, 3.7 GBq (100mCi) of  $^{131}\text{I}$  was administered after dis-



**Fig. 3** Whole body clearance curve of  $^{131}\text{I}$ .

continuing thyroid hormone therapy under low iodine diet. A whole body scanning showed intense uptake in the metastatic lesions (Fig. 2). Clearance curve was obtained by counting the whole body with a scintillation camera (Gamma View RC-1635LD, Hitachi Medico Corp.) (Fig. 3). Percent  $^{131}\text{I}$  uptake defined as the ratio of radioactivity inside the patient to given dose was 63.3% one day after administration. However, it rapidly decreased to 13.3% two days after administration. The patient complained the decrease of pain around the right hip joint. One year after total thyroidectomy, metastatic iliac bone tumor was resected in order to reduce the tumor volume. Thereafter, additional metastases to the left scapula and the left cervical node occurred, which were detected with thallium-201 scintigraphy (Fig. 4). Radioiodine therapy was repeated six times during four years after total thyroidectomy and total dose amounts to 28.49 GBq (770mCi). During this follow-up, lung metastases occurred. Half year before her death, lung metastases showed rapid increase in size suggesting anaplastic transformation. She survived for seven years after the first  $^{131}\text{I}$  therapy and for 27 years after the diagnosis.



**Fig. 4** Thallium-201 scan shows metastases to the right iliac bone, the left scapula, and the left cervical node.

#### Case 2

A 32 year-old female underwent total thyroidectomy with radical neck dissection for papillary thyroid carcinoma. One month after surgery 3.7 GBq (100mCi) of  $^{131}\text{I}$  was given. A whole body scanning showed abnormal uptake into lung metastases following prominent decrease in size of the tumors. Percent  $^{131}\text{I}$  uptake was 26.6% one day after the administration and less than the half of the value (63.3%) in Case 1 (Fig. 3). The second radioiodine therapy was performed one year after the first therapy and showed radioiodine uptake in the lung metastases. As shown in Fig. 3, the data of percent  $^{131}\text{I}$  uptake after three days in the second therapy showed more rapid clearance than in the first therapy, although the former agreed with the latter within two days. During six years after surgery, she received radioiodine therapy seven times. Total dose amounts to 29.23



**Fig. 5** (Case 3) 68-year-old female with papillary thyroid carcinoma.

An angiogram of the bronchial artery shows tumor stains.

GBq (790mCi). In spite of persistent multiple lung metastases, she is free from any complaints for this 13 years after surgery.

#### Case 3

A 61 year-old female underwent the left lobectomy for papillary thyroid carcinoma. After seven years without any complaints, she complained of cough, hemoptysis, and the left chest pain. Chest X-ray showed multiple fine nodular shadows in the lung field indicating lung metastases. The right lobectomy of the thyroid was added, but normal thyroid tissue near the recurrent nerve was slightly remained. On the scan with 185 MBq (5mCi) of  $^{131}\text{I}$  metastatic lesions showed no  $^{131}\text{I}$  uptake, while thyroid remnants did relative uptake. Thereafter, 3.7 GBq (100mCi) of  $^{131}\text{I}$  was administered, and lung metastases showed no  $^{131}\text{I}$

## 甲状腺分化癌の3症例：放射性ヨード治療の効率

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### 要 旨

甲状腺分化癌の遠隔転移に対して放射性ヨード治療を行ない、長期に経過観察された3症例について検討した。3例とも女性で、診断時の年齢は32, 36, 61歳、組織診断は乳頭腺癌2例、濾胞腺癌1例であった。骨転移あるいは肺転移をきたした2症例では転移病巣への<sup>131</sup>I取り込みが認められ、放射性ヨード療法が非常に有効であった。肺転移に<sup>131</sup>Iが取り込まれなかった1症例では、その後脳転移をきたして予後不良であった。甲状腺分化癌の遠隔転移に対し放射性ヨードが高い治療効果をあげるためには、<sup>131</sup>Iが多量に病巣に取り込まれ、かつできるだけ長く貯留することが必要である。