Scintigraphic detection of recurrence of medullary thyroid cancer

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A case of recurrent medullary thyroid cancer (MTC) was evaluated with $^{123}$I-MIBG, $^{99m}$Tc(V)-dimercaptosuccinic acid (DMSA), and $^{201}$Tl scintigraphy. This patient had been operated on for MTC in the right thyroid. Recently a left neck mass was noticed, and was suspected of being a recurrence of MTC based on increased plasma calcitonin (CT) and carcinoembryonic antigen (CEA). He was operated on for the neck mass which revealed MTC, and papillary thyroid cancer was incidentally found in the left thyroid, but the CT and CEA levels remained high, and remaining MTC tumor was suspected. But the location of the tumor was unknown. Although $^{99m}$Tc(V)-DMSA scintigraphy is generally believed to be superior in sensitivity to $^{123}$I-MIBG scintigraphy, it did not demonstrate the tumor site but $^{201}$Tl and $^{123}$I-MIBG did. Furthermore, $^{123}$I-MIBG scintigraphy has greater specificity for tumors which arise in the neural crest. Judging from the results of this case and cases reported in the literatures, both $^{123}$I-MIBG and $^{99m}$Tc(V)-DMSA should be performed in the detection of recurrent MTC.

**Key words:** medullary thyroid cancer (MTC), $^{123}$I-MIBG, $^{99m}$Tc(V)-DMSA, $^{201}$Tl

**INTRODUCTION**

MEDULLARY THYROID CANCER (MTC) originates in the parafollicular cells or C cells of the thyroid. At least 10% of MTC cases are familial, usually appearing as a component of multiple endocrine neoplasia II. MTC may present as a thyroidal mass or be clinically silent and unpalpable. The diagnosis is usually established by increased serum levels of calcitonin (CT) and/or carcinoembryonic antigen (CEA).1

It is often difficult to delineate the boundaries of recurrent MTC. Several scintigraphic methods have been proposed as markers of MTC. Thallium-201 ($^{201}$Tl),$^{2-4}$ $^{123}$I-$^{131}$I-meta-iodobenzylguanidine (MIBG)$^{6-9}$ and $^{99m}$Tc(V)-dimercaptosuccinic acid (DMSA)$^{10-13}$ were reported to accumulate in MTC, and $^{99m}$Tc(V)-DMSA was reported to have higher sensitivity for MTC than MIBG.$^{1,2}$ In this paper, we describe a patient with recurrent MTC whose recurrent tumor was studied with $^{201}$Tl, $^{123}$I-MIBG and $^{99m}$Tc(V)-DMSA scintigraphy. $^{201}$Tl and $^{123}$I-MIBG showed positive results and $^{99m}$Tc(V)-DMSA did not accumulate in the recurrent MTC tumor.

**CASE REPORT**

A 62-year-old man who had been operated on for MTC of the right thyroid lobe 22 years ago noticed a left neck mass and was admitted to our hospital. Increased CT (16,000 pg/dl) and CEA (397 ng/dl) levels indicated the recurrence of MTC and the left thyroid and left cervical lymph nodes were resected. Histological examination of the resected tissue revealed an MTC recurrent mass and primary papillary thyroid cancer. Serum CT and CEA levels remained high after the operation (Table 1) and a remaining MTC was suspected. A $^{201}$Tl scan showed positive accumulation in the mediastinum at the early scan and rapid clearance of activity at the delayed scan (Fig. 1). A $^{123}$I-MIBG scan was also performed which showed a positive image in the mediastinum (Fig. 2). The uptake of $^{123}$I-MIBG in the right submandibular gland was higher than that in the left, and the patient had sympathetic nerve dysfunction in the left half of the face after left thyroidectomy and lymph node dissection. The difference in $^{123}$I-MIBG uptake in the salivary glands should be due to the impairment of sympathetic function.
Table 1  Calcitonin and CEA

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<th>1994</th>
<th>1/19</th>
<th>1/31</th>
<th>2/1 (ope)</th>
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<th>5/16</th>
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<tbody>
<tr>
<td>Calcitonin (pg/ml)</td>
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<td>12,000</td>
<td>16,000</td>
<td>19,000</td>
<td>19,000</td>
<td>14,000</td>
<td>18,000</td>
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<tr>
<td>CEA (ng/ml)</td>
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<td></td>
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<td>400</td>
<td>396</td>
<td>398</td>
<td>416</td>
<td>436</td>
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Fig. 1  201TI scintigrams taken at early (taken at 20 minutes) and delayed (3 hours) phase were shown. Definite uptake was noted in the mediastinum at the early scan, and this uptake faded at the delayed scan.

Several scintigraphic methods have been used both for primary and recurrent MTC. 123I or 99mTcO4 scintigraphy is the most common thyroidal study method. MTC usually appears as a defect in the thyroid with these radionuclides, and they are not used to detect recurrent MTC. 201TI accumulation in recurrent MTC has been reported. In our case, 201TI uptake at the early scan and rapid clearance were noted. We also previously reported this pattern of 201TI uptake in a case of primary MTC. But, 201TI accumulation is also seen in other types of thyroid cancer. Because our patient had both MTC and papillary thyroid cancer, it was difficult to make a differential diagnosis scintigraphically.

131I-MIBG accumulation was reported in MTC, but a review of the literature showed that MIBG accumulation in sporadic cases of MTC was not high, indicating a preponderance of familial MTC cases. MIBG scan was not sufficiently sensitive to detect MTC, and MIBG has proven to be of value in the management of MIBG-positive MTC patients. 99mTc(V)-DMSA was developed...
by Yokoyama et al.,17 and has been reported to be useful in detecting MTC.18 Several reports agreed that DMSA had high sensitivity for detecting both primary and recurrent MTC.11,12 Some authors compared the sensitivity of MIBG and DMSA in MTC, and concluded that DMSA was more sensitive than MIBG.2,4 But, our case showed positive MIBG and negative DMSA scans. Even though DMSA scans are more sensitive for MTC than MIBG, both methods may be complementary in the detection of recurrent MTC.

REFERENCES

1. Busnardo B, Girelli ME, Simioni N, Nacamulli D, Busnardo E. Nonparallel patterns of calcitonin and carci-