Acute myeloid leukemia following radioactive iodine therapy for papillary carcinoma of the thyroid

Tiroid papiller karsinomu için verilen radyoaktif iyot tedavisi sonrası akut miyeloid lösemi

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Abstract

Radioactive iodine (RAI) therapy plays an important role in the management of thyroid malignancies. Leukemia is a very rare complication of radioactive therapy. There are very few case reports with doses below 100 mCi causing leukemia. We report a case of papillary carcinoma of the thyroid treated with 80 mCi RAI who later developed acute myeloid leukemia. Thus, all patients with thyroid carcinoma treated with RAI should undergo periodic hematological examinations irrespective of RAI dose. *(Turk J Hematol 2009; 26: 97-9)*

Key words: Radioactive iodine, thyroid carcinoma, acute myeloid leukemia

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Özet

Radyoaktif iyot (RAİ) tedavisi tiroid malignitelerinin yönetiminde önemli bir rol oynamaktadır. Lösemi, radyoaktif tedavinin çok nadir bir komplikasyonudur. 100mCi altındaki dozların lösemiye neden olduğunu bildiren çok az olgu raporu vardır. Biz, 80 mCi RAİ ile tedavi edilen ve sonrasında akut miyeoid lösemi gelişen bir tiroid papiller karsinom olgusunu bildiriyoruz. Bu nedenle uygulanan RAİ dozuna bakılmaksızın, RAİ ile tedavi gören bütün tiroid karsinomlu hastaların periyodik hematolojik tetkikleri yapılmalıdır. *(Turk J Hematol 2009; 26: 97-9)*

Anahtar kelimeler: Radyoaktif iyot, tiroid karsinomu, akut miyeloid lösemi

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Introduction

Radioactive iodine (RAI) is one of the most important modalities in the management of thyroid-related malignancies. All patients who have undergone a total or near-total thyroidectomy for a papillary or follicular carcinoma larger than 1 to 1.5 cm should be considered candidates for RAI ablation(1). RAI ablation decreases tumor recurrence, development of distant metastases and cancer death [2].

Leukemia is a rare complication of RAI therapy [3-6]. In the initial reports [3,6], almost all the cases have occurred after cumulative dosage of more than 800

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mCi, in patients more than 50 years of age and with intervals between dosage of RAI less than 12 months.

We now report the occurrence of acute myeloid leukemia in a 45-year-old male 17 months after receiving a total dose of 80 mCi. To our best knowledge, this is the first case of acute myeloid leukemia following RAI therapy for thyroid carcinoma with a dose below 100 mCi, although doses as low as 27 mCi have been reported in relation to acute myeloid leukemia following RAI treatment for hyperthyroidism [7].

Case Report

A 45-year-old male presented to the Nuclear Medicine Department of Kidwai Memorial Institute of Oncology in August 2005 with a history of near-total thyroidectomy for a nodular lesion in the thyroid three months before. The histopathology report was suggestive of papillary carcinoma thyroid. The patient had no past history of radiation exposure. There was no history of thyroid disease in his family. His clinical examination was within normal limits except for the surgical scar on his neck. He underwent the initial workup, which included hemogram, biochemistry, thyroid profile, chest X-ray, abdominal and pelvic ultrasound and histopathological review of slides. All the initial workup was within normal limits and review slides were consistent with papillary carcinoma of the thyroid.

The patient was then subjected to large-dose thyroid scan with 5 mCi of RAI, which showed homogeneous uptake in the thyroid region without any cold areas.

As the patient was an ideal candidate for RAI therapy, he received a single dose of 75 mCi for ablation of residual thyroid tissue as per the institutional policy. Further hospital stay of the patient was uneventful, and two days later suppressive dose of exogenous thyroid hormone was started. The patient was discharged and was advised to return for follow-up after one month.

The patient did not return for follow-up and presented in June 2007 with a one- week history of high-grade fever, bleeding gums and significant weight loss. Laboratory examination revealed a white blood cell count of 24,400/µL (differential count: neutrophils 13%, lymphocytes 25%, and peripheral blasts 50%). Hemoglobin was 8.7 g% and platelet count was 76,000/µL. A bone marrow aspirate and biopsy were consistent with acute myeloid leukemia (AML M5a of French-American-British [FAB] Classification). The blasts were nonspecific esterase-positive. Cytogenetics was suggestive of normal karyotype. The various treatment options were explained to the patient, but he left against medical advice.

Discussion

Leukemia is a very rare complication of RAI therapy, but there are still concerns about its possible carcinogenic effects. Transient leukopenia and thrombocytopenia were observed after RAI administration [8,9]. Bone marrow recovery after RAI treatment is delayed after 45 years of age. Bone marrow suppression after RAI treatment is divided into four grades according to World Health Organization (WHO) classification. The fourth grade is bone marrow aplasia and acute myeloid leukemia. A German cohort studied 107 patients with thyroid carcinoma with bone metastasis. In that study, four patients developed acute myeloid leukemia. These patients received maximum dose of RAI (11.1 GBq) within a very short interval and showed high uptake in bone metastasis [10].

Various mechanisms, like radioiodine-induced sub-lethal damage to bone marrow, which leads to chromosomal aberrations and oncogene activation followed by malignant transformation, are postulated [11,12]. Though acute myeloid leukemia is the commonest observed type of leukemia after RAI treatment [12], there are very few case reports with acute myeloid leukemia developed at doses <100 mCi (Table 1).

There are also case reports of acute lymphoblastic leukemia including Ph+ ALL following RAI therapy [17].

As in the literature, at least six cases including the pre-sent case showed that patients exposed to very low doses of RAI therapy (below 100mCi) can develop leukemia Regular follow-up is mandatory for all these patients irrespective of RAI dose received. As the advantages of RAI therapy have been proven beyond doubt in thyroid malignancies, all patients should receive the benefits of this time-tested therapy. The loss of life caused by recurrence of thyroid carcinoma exceeds that from leukemia by four- to forty-fold [18].

In conclusion, the benefits of RAI therapy outweigh the risk of acute leukemia in patients with papillary carcinoma of the thyroid. However, the patient should be followed regularly both clinically and hematologically for development of leukemia.

Table 1. Case reports of Leukemia with RAI dose below 100mCi

Authors	Age (yr)/ gender	i-131 dose (mCi)	Time interval from first dose	External radiation	Indication for RAI therapy	Type of leukemia
Walgraeve D et al. [13]	37/M	30	5 years	-	Papillary carcinoma	Chronic myeloid leukemia
Shimon et al. [14]	35/M	56	4 years	-	Papillary carcinoma	Chronic myeloid leukemia
Laurenti et al. [7]	45/F	27	14 months	-	Hyperthyroidism	Acute myeloid leukemia (FAB M2)
Kolade et al. [15]	51/F	22.1	27 months	-	Hyperthyroidism	Acute promyelocytic leukemia (FAB M3)
Jain et al.	46/M	80	17 months	-	Papillary carcinoma	Acute myeloid leukemia (FAB M5a)
Beierwaltes [16]	NA	100	1 year	-	Papillary carcinoma	Acute granulocytic leukemia

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