WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 6.805
Volume 5, Issue 8, 270-276. Case Report ISSN 2277– 7105

ACUTE MYELOID LEUKEMIA AFTER TREATMENT WITH RADIOACTIVE IODINE FOR PAPILLARY THYROID CANCER

Gamal Abdul Hamid*, Safa Shukry and Rasha Abbas

National Oncology Center, Aden, Yemen.

Article Received on
14 June 2016,

Revised on 05 July 2016,
Accepted on 26 July 2016

DOI: 10.20959/wjpr20168-6777

***Corresponding Author**
Dr. Gamal Abdul Hamid
National Oncology Center,
Aden, Yemen.

ABSTRACT

Radioactive Iodine (RAI) is widely used in the treatment of thyroid cancer. RAI is used after thyroidectomy to ablate the residual normal thyroid remnant, as adjuvant therapy, and to treat thyroid cancer metastases. Leukemia is a rare complication of ^{131}I therapy, usually occurring after cumulative dosages of more than 800 mCi and with intervals between doses of less than 12 months. It occurs in less than 2% of thyroid cancer patients and is associated with a poor therapeutic response and prognosis. We report the occurrence of acute myelogenous leukemia in a 78-yr-old woman had recurrent papillary thyroid carcinoma and long history with radioiodine therapy. Our patient was died after suffering from pancytopenic myeloid leukemia.

KEYWORDS: Thyroid cancer, Radioiodine, Acute myeloid leukemia.

INTRODUCTION

Radioactive iodine has been used to treat hyperthyroidism since 1940.[1] Radioidine (^{131}I) is used in the treatment of thyroid cancer since 1946 in order to eliminate residual thyroid tissue following total or near total thyroidectomy for papillary or follicular carcinoma large than 1 to 1.5 cm and to treat metastatic disease.[2-8] Acute risks associated with RAI therapy include nausea and vomiting, ageusia (loss of taste), salivary gland swelling, and pain. Longer-term complications include recurrent sialo-adenitis associated with xerostomia, mouth pain, dental caries, pulmonary fibrosis, nasolacrimal outflow obstruction, effect on fertility, and second primary malignancies.[2,9-12] Some authors feel that the risk of a secondary tumor associated with ^{131}I therapy is low and lacks clinical impact.[13,14] The relative risk approximates 1.21 to 1.9 per 10,000 patient years compared to the general population and is greatest for hematologic malignancies.[15,16] Leukemia is rare complication or late effect of exposure to

RAI therapy and was first reported in 1955, almost all the cases have occurred after cumulative dosage of more than 800mCi, in patients more than 50 years of age and with intervals between dosage of RAI less than 12 months. Although cases of patients developing leukemia after multiple doses of radioactive iodine are reported, the link with the treatment is still a matter of debate.[6,8,16-18] We report female patient 78 years old female who were admitted to National oncology center, Aden, Yemen after accumulative dosage of RAI, this is first case registered in our center of AML following RAI of recurrent papillary carcinoma of thyroid gland.

CASE REPORT

A 78 year-old female, Yemeni presented to the National Oncology Center-Aden (NOC-Aden) in April 26/2016 with a history of recurrent papillary carcinoma of thyroid gland. In 2007; She diagnosed as papillary thyroid cancer and underwent thyroidectomy and treated with multiple doses of radioactive iodine. The patient from that time was healthy and free of complain.

In 12/2015; she was complain of productive frank bloody cough, moderate amount, no clots, not associated with shortness of breath and no chest pain, there was no neck swelling no difficulty with swallowing, no change in the patient voice, there was no heat intolerance, there was constipation, and no other symptoms related to her presentation. The patient was then subjected to low dose of ^{131}I, the dose was 4 mci in reevaluation which showed two diffuse areas of radiotracer uptake seen at anterior part of neck at both sides of trachea and diffuse radiotracer uptake was seen in both lung. The laboratory investigation of thyroglobulin was 2346 ng/ml (1.4-78 ng/ml) and thyroid stimulating hormone (TSH) 58.7uIU/ml (0.35-4.94). The debulking thyroidectomy was done. The histopathology report Was confirming of recurrent papillary thyroid carcinoma. After that she received 110 mci ^{131}I and post ablation scan which showed diffuse area of abnormal radiotracer uptake seen in both lung fields and there was complete removed of neck mass .

In April 2016; the patient presented in our NOC-Aden was complain of signs and symptoms of pancytopenia. The laboratory examination of hemoglobin (Hb) 7.3 g/dl, white blood cell (WBC) 3000 /cmm and platelet count 14.000/cumm, peripheral blood film picture of pancytopenia and present of blast cells. A bone marrow examination was consistent with 35% of atypical blast cells, acute myelomonoblastic leukemia (M4 of French-American-British FAB) confirmed by immunophenotyping (Figure 1).

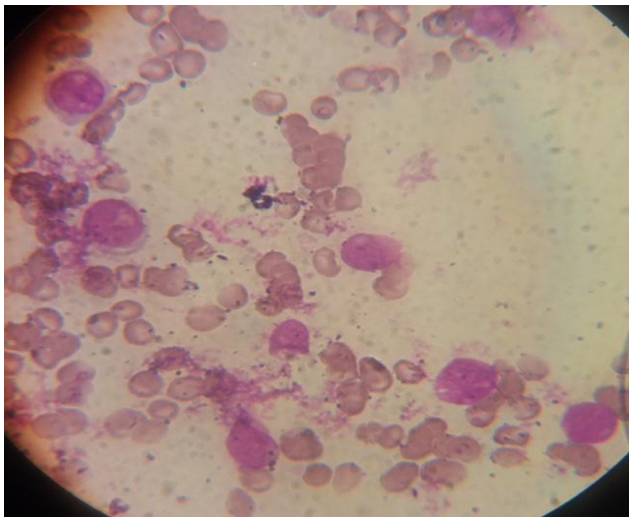

Figure 1: Bone marrow cytology; pancytopenia and presence of myelomonocytic blasts infiltration

DISCUSSION

Radioactive iodine therapy has been one of the most important modalities in management of toxic nodular goiter, Grave disease, and thyroid cancer. The relative risk of secondary acute myeloid leukemia in thyroid cancer patients is higher in those treated with RAI than those without.[10,18]

Therapy-related acute myeloid leukemia (t-AML) is well described after chemotherapy or radiotherapy for diverse malignancies. Radioisotope therapy is also recognized as a less-common cause of t-AML and occurs in less than 2% of thyroid cancer patients and is associated with a poor therapeutic response and prognosis.[19-23] Ionizing radiation like radioiodine-induced sub-lethal damage to bone marrow, which leads to chromosomal aberrations and oncogene activation causing hematological malignancy, are postulated.[3,6,10,18-19]

This case had recurrent papillary thyroid carcinoma and transformed to acute myeloid leukemia (M4) after receiving multiple doses of ^{131}I. In compare with other studies; Jain Ankit et al 2009, report a case of papillary carcinoma of the thyroid treated with 80 mCi RAI who later developed acute myeloid leukemia.[6] Bitton R et al (1993) also reported the occurrence of acute myelogenous leukemia in a 28-year-old woman 14 months after receiving a total dose of 300 mCi^{131}I for metastatic follicular thyroid cancer[2]. Oscar Boutros et al (2014) reported the case of a young woman who developed AML with monocytic differentiation and Trisomy 8 cytogenetic abnormality after RAI treatment for thyroid

papillary carcinoma.[20] Ji Hun Jeong et al (2012) reported a case of a 38-year-old woman who developed t-AML (M4) with inv(16)(p13.1q22) with markedly increased eosinophils, and K-ras mutation were noted after treating her for thyroid cancer with a single low intensity dose of ^{131}I.[18]

A study research by Mijeong IM et al (2008) reported four cases of secondary hematologic malignancy, who received iodine therapy for thyroid cancer after thyroidectomy: two cases of acute lymphoblastic leukemia with t(9;22)(q34;q11.2), a case of MDS with 5q deletion, and a case of MDS with normal karyotype. Three cases of hematologic malignancy have developed after cumulative dosage of less than 800 mCi. The treatment intervals in two cases were less than 12 months, and the other two cases had I131 therapy only once.[24] Focosi et al (2007) reported two patients who were admitted to their clinic 12 and 17 years after very low-dose radioiodine exposure for thyroid diseases with acute myeloid leukaemia and follicular lymphoma.[8] Trikalinos NA et al (2013) described a patient with acute erythroid leukemia after radioactive iodine administration for papillary thyroid cancer, with an unbalanced 11;18 translocation resulting in three copies of 11q, including the MLL gene.[19] There are also case reports of acute lymphoblastic leukemia including Ph+ ALL following RAI therapy.[25]

In those studies revealed patients at risk are generally in women and have received a cumulative dose from 8 mCi to 800 mCi. The risk is greatest when this large dose has been given over a short period of time (6 to 12 weeks) and with cytogenetic abnormality. Although others studies revealed that hematological malignancy developing in patients treated with any dose of ^{131}I therapy. 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. To minimize the risk for leukemia there should be a 1 year interval between therapies and a total cumulative dose of administered activity should not to exceed 800 mCi. It is important to note that the mortality from recurrence of thyroid carcinoma exceeds that from leukemia by 4 to 40 fold.[20,26-27]

CONCLUSION

The case presented here is a rare case in t-AML that developed after recurrent papillary thyroid cancer with radioiodine therapy in different interval times with unclear mechanism. In different studies revealed the developing of secondary acute leukemia (SAL) not related to

the dose of ^{131}I, because it may develop at any dose but more related to the short time of exposure to ^{131}I.

Recommendation

The patient should be followed regularly both clinically and hematologically for development of leukemia or other hematological malignancies.

This type of complications stresses the need for specific research programs focusing on the risk factors that influence the occurrence of secondary acute leukemia (SAL) in cancer survivors. However, the possibility that the emergence of SAL can be connected just as much to environmental factors as to thyroid cancer cannot be excluded and larger scale studies may help to identify them.

REFERENCE

1. AL-Shaikh A. A.; Outcome of hyperthyroidism treated by Radioactive iodin. Pak J Med Sci., April-June, 2009: 25(2): 293-297.
2. Bitton R, Sachmechi I, Benegalrao Y, Schneider BS. Leukemia after a small dose of radioiodine for metastatic thyroid cancer. J ClinEndocrinol Metab, Nov, 1993; 77(5): 1423-6.
3. Anne Sophie Weingertnera, Marc Wiltb, IhabAtallaha, et al. Myeloid Sarcoma of the Uterine Cervix as Presentation of Acute Myeloid Leukaemia after Treatment with Low-Dose Radioiodine for Thyroid Cancer: A Case Report and Review of the Literature. Case report Oncology, published online: January 17; 2009. S. karger AG. Basel ISSN 1662-6575. www.karger.com/cro
4. Roldan Schilling V, Fernandez Abellan P, Dominguez Escribano JR, Rivas Gonzalez C, MutBarbera E, CalatayudCendra R: Acute leukemias after treatment with radioiodine for thyroid cancer. Haematologica, 1998; 83: 767–768.
5. Laurenti L, Salutari P, Sica S, Piccirillo N, Zini G, Zollino M, Leone G: Acute myeloid leukemia after iodine-131 treatment for thyroid disorders. Ann Hematol, 1998; 76: 271–272.
6. Jain Ankit, Premalata CS, Saini KV, Bapsy PP, et al. Acute myeloid leukemia following radioactive iodine therapy for papillary carcinoma of the thyroid. Turk J Hematol, 2009; 26, 97-9.
7. Lee SL, Complications of radioactive iodine treatment of thyroid carcinoma. J Natl Compr Canc Netw, Nov, 2010; 8(11): 1277-86; quiz 1287.

8. D. Focosi et al. Acute myeloid leukemia and follicular lymphoma after very low dose radioiodine therapy for thyroid diseases. Hematologica, 2007; 92(9): e96-e97. Dol: 10.3324/hematol.11981.
9. Chow SM. Side effects of high-dose radioactive iodine for ablation or treatment of differentiated thyroid carcinoma. JHK Coll Radiol, 2005; 8: 127-135.
10. Anna M. Sawka, LehanaThabane, Luciana Parlea, et al. Second Primary Malignancy Risk After Radioactive Iodine Treatment for Thyroid Cancer: A Systematic Review and Meta-analysis. THYROID, 2009; 19(5): [a]Mary Ann Liebert, Inc. DOI: 10.1089=thy.2008.0392.
11. Chuang SC, Hashibe M, Yu GP, Le AD, Cao W, et al. Radiotherapy for primary thyroid cancer as a risk factor for second primary cancers. ancer Lett., Jul 8, 2006; 238(1): 42-52. Epub, Jul 21, 2005.
12. Dottorini ME, et al. Assessment of female fertility and carcinogenesis after iodine-131 therapy for differentiated thyroid carcinoma. J Nucl Med., 1995; 36: 21-27.
13. Hall P, et al. Tumors after radiotherapy for thyroid cancer. Acta Oncologica, 1992; 31: 403-407.
14. Petrich T, et al. Outcome after radioiodine therapy in 107 patients with differentiated thyroid carcinoma and initial bone metastases: side-effects and influence of age. Eur J Nucl Med., 2001; 28: 203-208.
15. Brown AP, et al. The risk of second primary malignancies up to three decades after the treatment of differentiated thyroid cancer. J ClinEndocrinol Metab, 2008; 93: 504-515.
16. Laurenti L, Salutari P, Sica S, Piccirillo N, et al. Acute myeloid leukemia after iodine-131 treatment for thyroid disorders. Ann Hematol, Jun, 1998; 76(6): 271-2.
17. Hall P, Boice JD Jr, Berg G, Bjelkengren G, Ericsson UB, et al. Leukaemia incidence after iodine-131 exposure. Lancet, Jul 4, 1992; 340(8810): 1-4.
18. Ji Hun Jeong, Jeong YealAhn, Soon Ho Park, Mi Jung Park, et al. A case of therapy-related acute myeloid leukemia with inv (16)(p13.1q22) after single low-dose iodine-131 treatment for thyroid cancer. Korean J Hematol, Sep 25, 2012; 47(3): 225–228.Published online. doi:10.5045/kjh.2012.47.3.225
19. Trikalinos NA , Chen Q , Ning Y, et al, Unbalanced 11;18 translocation in an acute erythroid leukemia after radioactive iodine therapy. Cancer Genetics J Article, 2013; 206(6): 252-255. DOI: 10.1016/j.cancergen.2013.06.003.
20. Oscar Boutros Lahoud, Dhakal Ajay, Abhinav B Chandra. Early Occurrence of Therapy-Related Acute Myeloid Leukemia (t-AML) with Monocytic Differentiation with Trisomy

8 Cytogenetic Abnormality after Radioactive Iodine (RAI) Treatment for Papillary Thyroid Cancer. American Soiety of Hematology, December 6, 2014; Blood: 124(21).

21. Sawka AM, Thabane L, Parlea L, et al. Second primary malignancy risk after radioactive iodine treatment for thyroid cancer: a systematic review and meta-analysis. Thyroid. 2009; 19: 451–457.
22. Pochin EE. Prospects from the treatment of thyroid carcinoma with radioiodine. ClinRadiol. 1967; 18: 113–125.
23. Pochin EE. Leukaemia following radioiodine treatment of thyrotoxicosis. Br Med J., 1960; 2: 1545–1550.
24. MijeongIm, Jin Kyung Lee, Young Joon Hong, et al. Four Cases of Hematologic Malignancy Following Radioactive Iodine Therapy for Thyroid Cancer. Korean J Lab Med., Dec 31, 2008; 28(6): 425-429. Published online: http://dx.doi.org/10.3343/kjlm.2008.28.6.425.
25. Piccirillo N, Sorà F, Laurenti L, Sica S, Chiusolo P, Leone G. Ph+ acute lymphoblastic leukemia after iodine-131 treatment for thyroid cancer Haematologica, 1999; 11: 1051-2.
26. Chow SM, et al. Follicular thyroid carcinoma. Prognostic factors and the role of radioiodine. Cancer, 2002; 95: 488-98.
27. Bushnell DL, et al. Complications, sequela and dosimetry of iodine-131 therapy for thyroid carcinoma. J Nucl Med., 1992; 33: 2214-21.