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Blood cells in thyroid cancer patients: a possible influence of apoptosis

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Abstract: The side effects of radioactive iodine (131-I) treatment of differentiated thyroid cancer (DTC) patients include reduction of peripheral blood cell counts. The aim of this study was to analyze some potential changes in blood cell counts of DTC patients after 131-I therapy, especially CD3-positive, CD19-positive, and CD56-positive peripheral blood lymphocytes (PBL), as well as the possible role of apoptosis in selected lymphocyte populations. The study group included 24 thyroid cancer patients and 24 control subjects. Peripheral blood samples from patients and controls were analyzed using 5-color flow cytometry. Apoptotic cells were detected using an Annexin V-FITC/7-AAD kit. There was a statistically significant decrease of all blood cells after the 131-I therapy. The CD19+ B lymphocyte population was the most affected (5.82 ± 3.21% before therapy vs. 3.93 ± 2.60% after therapy, p = 0.008). This decrease was correlated with the degree of apoptosis of peripheral blood lymphocytes (Spearman's r = 0.563, p = 0.013). We concluded that 131-I therapy of DTC patients led to a decrease of all peripheral blood cells, especially CD19+ B lymphocytes. This directly correlated with apoptosis of PBLs, indicating that radiation damage to B cells leads to subsequent elimination by apoptosis.

Keywords: Differentiated thyroid cancer, peripheral blood cells, apoptosis

1 Introduction

Thyroid cancer is the most common malignancy of the endocrine system; its incidence has been increasing over the past 20 years [1]. Differentiated thyroid cancer (DTC) accounts for more than 90% of all thyroid cancers and includes papillary, follicular, and poorly differentiated histological types [2]. Following surgery, treatment of DTC patients with radioactive iodine (131-I) is a standard procedure for the ablation of remnant thyroid tissue and for the treatment of iodine-avid metastases [3, 4]. According to the recommendations of American Thyroid Association (ATA), 131-I administration is indicated in patients with a moderate to high risk of recurrence, based on age, tumor size, lymph node status, and extrathyroidal extension as well as on histological type of the thyroid tumor [2,3]. Side effects of 131-I treatment may occur in many organ systems, including the lacrimal glands, bone marrow, lungs, and reproductive organs [5,6]. Although transient anemia and thrombocytopenia following 131-I treatment have been described [6-9], the most pronounced effect of ionizing radiation is on peripheral blood leukocytes [7, 10]. Most published findings indicate that the effect of 131-I on peripheral blood lymphocytes depends on their phenotype and the time elapsed since the application of 131-I. However, the rapid fall in peripheral blood lymphocyte counts after 131-I treatment has not been clarified to date. Because we have recently shown increased apoptosis of peripheral blood lymphocytes in DTC patients treated with 131-I [11], the objective of this study was to investigate whether that treatment had an impact on CD3-positive, CD19-positive, and CD56-positive lymphocytes counts in peripheral blood of DTC patients after 131-I therapy.

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