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DNA Breaks and Repair in Euthyroid Patients with Nodular Goiter can Predict Cancer and be a Biomarker?

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Abstract

Aim: Although the majority of thyroid nodules commonly seen in most of people are benign, thyroid cancer accounts for a small proportion of thyroid nodules. In recent years, the combined assay of the histone subunit H2AX phosphorylated (γ-H2AX) and 53BP1 was used to determine DNA damage such as DNA double-strand breaks (DSBs) and the DNA repair protein of p53 binding protein 1 (53BP1), as a biomarker for the response of cellular stress. The purpose of present study was to evaluate DNA damage and DNA repair capacities of peripheral mononuclear cells from whole blood in euthyroid patients with nodular goiter by using combined γ-H2AX and 53BP1 assay and a fully automatic image analysis system.

Methods: Peripheral blood samples of euthyroid patients with nodular goiter untreated and new diagnosed (n=33) and healthy control subjects (n=52) were prepared according to combined γ-H2AX and 53BP1 assay. The foci of γ-H2AX for DNA damage and 53BP1 for DNA repair was analysed using an automated reading system.

Results: In our study, the number of γ-H2AX foci per cell, γ-H2AX positive cell ratio and 53BP1 positive cell ratio of euthyroid patients with nodular goiter was found to be higher than in those of control subjects ($p<0.05$).

Conclusion: In this study, we showed that DNA damage (DNA DSBs) and DNA repair capacities were increased in blood samples of euthyroid patients with nodular goiter using γ-H2AX and 53BP1 foci analysis. Increased genome damage is events that can be seen in the early stages of carcinogenesis. This increase in DNA damage of euthyroid patients with nodular goiter is indicated increased genome damage in these patients and may be associated with possible future cancer risk. Our results clearly demonstrated the importance of long-term follow-up of euthyroid patients with nodular goiter in order to the increased malignancy risk.

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Keywords: Genome damage; γ-H2AX assay; 53BP1; euthyroid; nodular goiter

Table 1. The number of γ-H2AX and 53BP1 foci per cell and γ-H2AX and 53BP1 positive cell ratio in euthyroid patients with nodular goiter and control subjects (mean±SD).

	Patients	Controls	P value (Mann-Whitney U test)
The number of γ-H2AX foci	0.62±0.89	0.25±0.35	0.046*
γ-H2AX positive cell ratio (%)	19.14±21.62	7.99±9.43	0.039*
The number of 53BP1 foci	10.47±10.09	13.54±17.30	0.308
53BP1 positive cell ratio (%)	19.21±13.27	15.22±15.85	0.030*

*($p<0.05$).

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