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ORIGINAL ARTICLE

Baseline and therapy-induced chromosome damages in peripheral blood lymphocytes of breast cancer patients assessed by the micronucleus assay

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Summary

Purpose: *Radiotherapy (RT) alone or in combination with chemotherapy (CT) leads nearly always to increase of DNA damage in cancer patients. The purpose of this study was to determine the variability rate and individual sensitivity of breast cancer (BC) patients to the applied RT and RT in combination with CT.*

Methods: *The analysed sample included 30 women with histologically confirmed BC. The frequency of micronuclei (MN) was estimated in peripheral blood lymphocytes (PBL) by using the cytokinesis-block micronucleus (CBMN) assay before the administered therapy and one month later.*

Results: *The mean therapy-induced MN value was significantly higher ($p < 0.001$) compared with mean baseline MN. Both therapies (RT and combined RT+CT) significantly increased the MN frequency in patients' lymphocytes ($p<0.001$), but without significant differences in the therapy-induced MN frequency between these two groups ($p > 0.05$). The administered therapy induced significant difference in cell kinetics ($p < 0.05$). The results showed a wide range of inter-individual variability in both baseline and the therapy-induced MN frequency.*

Conclusion: *The applied therapies increased the MN frequency in PBL in BC patients, and the presented data indicate absence of synergistic effect of these two therapies. None of the variation factors (age, smoking and therapy type) had influence on the noticed variability.*

Key words: breast cancer, chemotherapy, micronuclei, peripheral blood lymphocytes, radiotherapy

Introduction

BC remains the most common malignancy in females worldwide and, with over 1500000 new cases and over 400000 deaths annually, it represents an important global health problem [1]. In Serbia, BC ranks first in cancer incidence in women, with almost 4000 new cases and 1500 deaths per year [2]. In contrast with Western Europe, the mortality of BC patients in Serbia has increased in the last 30 years.

Molecular profiling has shown that BC is not a simple disease with a single tumorigenic pathway, but a rather heterogeneous one [3]. Out of all BC patients, 5-10% show inherited gene mutations [4] and 2% have a strong predisposition caused by the highly penetrable BRCA1 and BRCA2 genes [5].

In addition to endogenous factors in the etiology of BC, exogenous factors such as drinking habits [6], reproductive factors [7], age [8] etc play a significant role.

Tumor size, lymph node status, endocrine receptor status and human epidermal growth receptor 2 status (HER2) are standard parameters for therapeutic recommendations and outcome predictors for BC patients [9]. Surgery as a treatment of early-stage BC is usually followed by adjuvant RT and adjuvant CT. The aim of these two therapies is to prevent locoregional and/or distant disease relapse after surgery. Omission of RT is related to increased ipsilateral BC recurrence and with a small increase in mortality [10]. RT can also provide palliation in some metastatic localisations [11]. BC patients also receive adjuvant systemic therapies to achieve early eradication of possible micrometastases. Significant improvement in both disease-free survival (DFS) and overall survival (OS) has been confirmed in

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