

flow cytometry (antibody to $\gamma\delta$ T cell receptor and CD45RO memory marker), cell culture in the presence of isopentenyl pyrophosphate (IPP) and statistical data processing. The control group was healthy donors ($n = 17$) of the same age and gender (group 3).

The investigation of $\gamma\delta$ T lymphocytes in peripheral blood revealed the significant increase of $\gamma\delta$ T cells percentage in patients of group 2 with cirrhosis (4,8 [4,09 ÷ 6,6] %) compared to healthy donors (3,54 [2,07 ÷ 5,70]%, $p < 0,05$) while there were no significant differences in $\gamma\delta$ T cells quantity in patients of group 1 with HCV-infection and fibrosis stage 0–3 scores (3,37 [1,97 ÷ 4,69]%). At the same time, the number of $\gamma\delta$ T lymphocytes subpopulation with a memory cell phenotype in both patients groups was characterized by a significant decrease in relative to the control group: 3,84 [2,28 ÷ 13,1] % – in patients with HCV-infection at the early stage of fibrosis; 5,39 [2,5 ÷ 12,5] % – in patients with HCV-infection at the stage of cirrhosis and 21,50 [4,10 ÷ 28,40] % – control group.

After a 6-day cultivation of peripheral blood mononuclear cells a significant increase of spontaneously activated $\gamma\delta$ T cells memory was detected in HCV-patients of both groups (22,94 [18,88 ÷ 30,82] %) – in group 1 and 15,96 [5,93 ÷ 30,10] %) – in group 2) compared to healthy donors (9,71 [1,52 ÷ 32,90] %; $p < 0,01$). Under IPP-stimulated conditions the number of $\gamma\delta$ T cells elevated only in patients with HCV-infection at the early stage of fibrosis (22,64 [10,56 ÷ 30,50] %) but not in cirrhosis patients (13,45 [8,87 ÷ 22,77] %) compared to healthy donors (12,30 [8,20 ÷ 25,65] %). Moreover in patients of group 2 the index of stimulation significantly decrease (1,88 [1,39 ÷ 5,35]) compared to healthy donors (2,98 [2,96 ÷ 4,14] %) as well as to patients of group 1 (3,16 [1,75 ÷ 4,21]).

Thus, the changes in $\gamma\delta$ T cells quantity and functional status are revealed in patients with HCV-infection: the more disease progression is – the more $\gamma\delta$ T cells are in circulation with terminal differentiated effector memory phenotype (CD45RO-) and the less their functional ability is what may explain one of the defective mechanisms in immunological surveillance of HCV-infection.

BIBLIOGRAPHY

1. Professional antigen- presentation function by human T cells / M. Brandes, K. Willmann, B. Moser // Science. – 2005. – Vol. 309. – P. 264–268
2. Кудрявцев, И. В. Т- клетки памяти: основные популяции и стадии дифференцировки / И. В. Кудрявцев // Росимуноложурн. 2014. – С. 947–964.

DEPENDENCE OF THE PTV VOLUME ON THE NUMBER OF NEEDLES DURING HDR BRACHYTHERAPY FOR POSTATE CANCER

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In the Republic of Belarus, the incidence of prostate cancer is in 3rd place and amounts to 46.3 cases per 100 thousand men. One effective treatment for prostate cancer is the conversion of high-dose-rate (HDR) brachytherapy. The purpose was to determine the effect of prostate volume on the number of needles to be installed.

Keywords: brachytherapy, prostate cancer.

HDR brachytherapy treatment procedure of prostate cancer in N. N. Alexandrov National Cancer Center of Belarus proved to be a comfortable method of treatment, effective for patients with low, medium and high risk.

The procedure for HDR brachytherapy for prostate cancer includes the following steps: spinal anesthesia, patient preparation for the procedure, acquisition of ultrasound images and preliminary planning, the insertion of needles into the prostate gland, real planning, export of the treatment plan to the treatment control station, treatment delivery, needles removal. The purpose of this study was to determine the effect of prostate volume on the number of needles to be inserted.

210 real dosimetric plans for irradiating the prostate with high-dose-rate brachytherapy were analyzed. For the analyzed plans, D90 was higher than the prescribed dose, i.e. > 13,5 Gy. PTV V100 was at least 95% of the prescribed dose. Dose limits for OAR meet GEC / ESTRO recommendations [1]: rectum D2cc ≤ 75 Gy EQD2; urethra D0,1cc ≤ 120 Gy EQD2, urethra D10 ≤ 120 Gy EQD2, urethra D30 ≤ 105 Gy EQD2 for the general course of radiation therapy.

The size of PTV was 22547,84 mm³ – 97805,13 mm³, and the number of needles ranged from 11 to 21. Further, to detect the presence of a correlation between the volume of the prostate gland and the number of needles in-

serted into the prostate, a correlation analysis was performed in STATISTICA 10. The distribution of the volume parameter of the prostate gland and the parameter of the number of needles were checked for normality using the Kolmagorov – Smirnov criterion. Both distributions obeyed the normal distribution, as shown in Fig. 1.

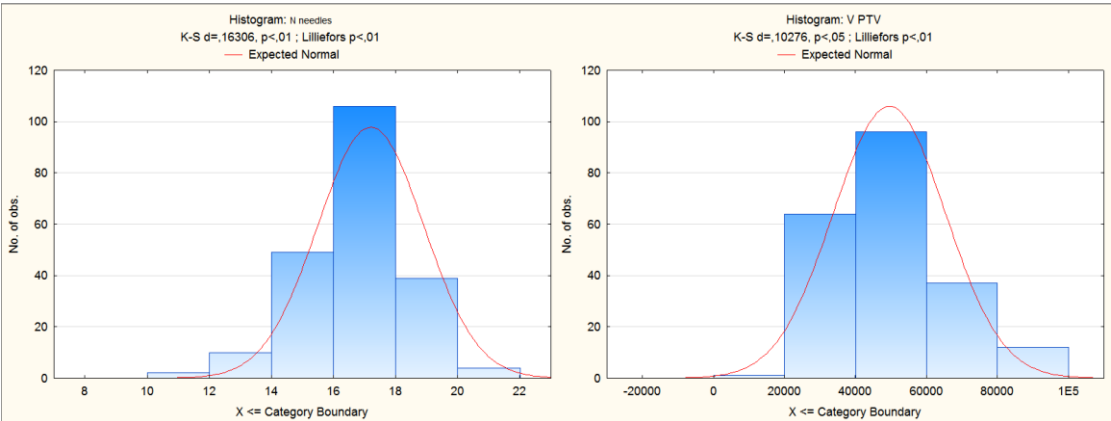


Fig. 1. – Histograms of the distribution of random variables: a) needles; b) volume of PTV

The Pearson correlation coefficient was found. The results of calculating the Pearson coefficient are present- in Fig. 2.

Correlations (Spreadsheet1)	
Marked correlations are significant at p < .05000	
N=210 (Casewise deletion of missing data)	
Variable	
V PTV	1,0000
N needles	-.0907
	p= ---
N needles	-.0907
	p=,190

Fig. 2. – Pearson coefficient calculation results some

The correlation coefficient was equal to – 0,0907. This value indicates the presence of a weak negative relationship between the variables. But the value of p was 0,19, which is significantly higher than the acceptable level of significance. (0,05). Therefore, the hypothesis that there is a relationship between the parameter of the volume of the prostate gland and the number of needles is rejected. These parameters are not linearly dependent. Fig. 3 shows the scattergram of the parameters of the volume of the prostate gland and the number of needles.

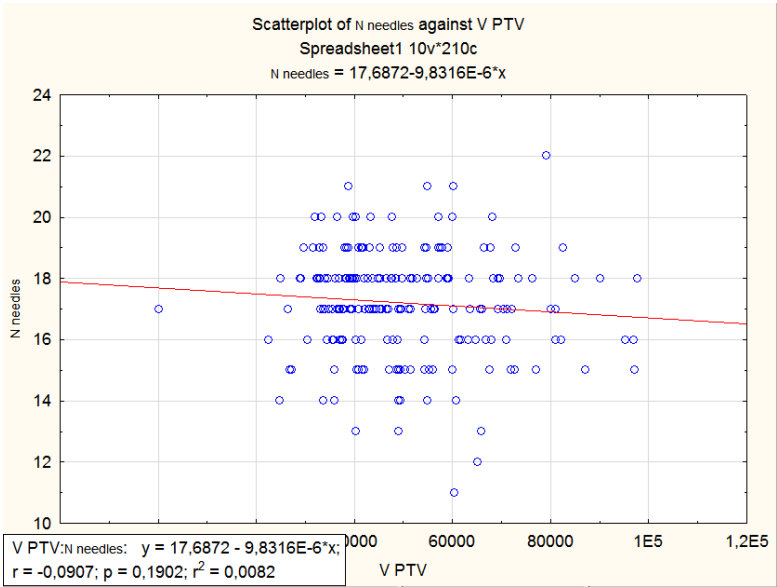


Fig. 3. – Scattergram of the parameters of the volume of the prostate gland and the number of needles

The number of installed needles is linearly independent of the volume of the prostate gland. The same prostate volume can be irradiated using a different number of needles with DVH parameters that comply with the GEC / ESTRO guidelines [2]. Therefore, for dosimetric plans, it is possible to reduce the number of catheters while observing the requirements for target coverage and dose constraints.

For further evaluation, a more thorough analysis is required, presumably the width of the prostate gland and the installation of a fixed board relative to the organ.

BIBLIOGRAPHY

1. Hoskin, P. J. GEC/ESTRO recommendations on high dose rate afterloading brachytherapy for localised prostate cancer: An update / J. Peter Hoskin [et al.] // *Radiotherapy and Oncology*. – 2013. – Vol. 107. – P. 325–332.
2. Joiner, M. C. *Clinical Radiobiology* / Michael C. Joiner, Albert J. van der Kogel. Boca Raton, FL: CRC Press/Taylor & Francis Group, 2018. – P. 361.

IMPACT OF 3-HYDROXYPYRIDINE DERIVATIVES ON CYTOSTATIC AND ANTIPROLIFERATIVE ACTIVITY OF ARABINOFURANOSYLCYTOSINE-5'-MONOPHOSPHATE

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The incidence of malignant neoplasms around the world is steadily increasing. That is why the search for drugs that prevent the development of tumors, the study of the laws of carcinogenesis is one of the main tasks of anti-tumor control. An important feature of tumor growth is the change in the level of free radical reactions, which is manifested in the increased antioxidant activity of tumor tissue, on the one hand, and the depletion of the antioxidant defense system of the tumor-bearing organism, on the other. The value of antioxidant activity is essential for the processes of cell proliferation, as antioxidants are involved in the regulation of cell reproduction. In this regard, it is attractive to search for substances or their combinations with antioxidants, the use of which will lead to a decrease in intoxication in the body of tumor carriers.

In the present work we studied the influence of modified nucleotide arabinofuranosylcytosine-5'-monophosphate in the form of the free acid (ara-CMP) and its salts with the synthetic derivatives 3-hydroxypyridine emoxipin (ara-CMP+Em) on the viability of mononuclear cells in the peripheral blood, the number and lymphocyte proliferation in mitogen-induced stimulation of the cells. Under ara-CMP lymphocytes not only stopped cell division and increased cell death, but as well as fractions of secreting pro-inflammatory cytokines cells were increased. It is known that increasing of pro-inflammatory cytokines level is a systemic reaction to the increased ROS levels due to destruction of cells. Note that the presence of emoxipin (substances that have antioxidant properties) almost completely neutralized the observed effect.

BIBLIOGRAPHY

1. Tsesmetzis, N. *Cancers* / N. Tsesmetzis, C. B. J. Paulin, S. G. Rudd, N. Herold. – 2018. – № 10. – C. 240–248.
2. Block, K. I. *Cancer* / A. C. Koch, M. N. Mead, P. K. Tothy, R. A. Newman, C. Gyllenhaal. *Int. J.* – 2008. – № 15. – C. 1227–1239.
3. Pan, H. *Pharmacol.* / H. Pan, P. Mukhopadhyay, M. Rajesh, V. Patel, B. Mukhopadhyay, B. Gao, G. Haskó, P. J. Pacher. – *Exp. Ther.* – 2008. – № 12. – C. 24–28.

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