The Production and Use of Labeled Positron-Emitting Radionuclides of 18F (FDG) in Nuclear Medicine

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This paper presents the results of studies using radiotracer "solution [18F] – fluorodeoxyglucose" with the use of PET/CT method. Calibration studies were performed for PET/CT machine with 22Na source; installation of PET/ CT scanner was performed and the program Topas-Vicro was studied to eliminate artifacts arising during operation; the possibility of formation of artifacts was excluded in the study and definition of the ellipse of the head in brain research. On the basis of the application of labeled ultra-short living radionuclides (18F-FDG), malignant tumors and metastases were identified in the bodies of patients.

The aim of this work is the production and use of labeled positron-emitting ultra-short living radionuclides for the radioisotope diagnosis using the positron emission tomography.

This paper presents the results on the production and use of radiopharmaceutical (hereinafter - RPC) "Fluorodeoxyglucose, 18F" on cyclotron Cyclone 18/9 in Astana on the basis of JSC "National Diagnostic Center" to diagnose complex oncological, neurological and cardiovascular diseases. RPC "Fluorodeoxyglucose, 18F" is used as a diagnostic tool for the positron emission tomography (PET) combined with computed tomography (hereinafter - PET/CT).

The methodology of the research: The main research method was the PET/CT method - the newest method based on the use of ultra-short living radioisotopes. An essential component of the production is cyclotron, which yields 18F isotopes, and then in laboratory of radiochemical synthesis get labeled positron-emitting radiopharmaceuticals.

At present, the series of first experimental data on the production of the radiopharmaceutical (18F-FDG) were obtained. Research is carried out using the methods of PET/CT.

The results of research As it is well known, more than 90% of the PET/CT is performed with an analog of glucose - fluorodeoxyglucose, in which a stable fluorine is replaced by the radioactive one, resulting in ultra-short living radiopharmaceutical of 18-fluorodeoxyglucose-18F-FDG.

The investigation of patients was performed and corresponding PET/CT pictures of patients were obtained. The analysis and interpretation of these data

were performed; appropriate conclusions were obtained and prepared: using ultra-short living tracer radionuclide (18F-FDG), malignant tumors and metastases were detected in the bodies of patients.

Conclusions: the production and use of labeled positron-emitting radionuclides of 18F-FDG are of great value in the field of nuclear medicine. PET/CT studies using 18F-FDG reveal the diseases at an early stage when the cure is possible, as well as improvement of the condition and extension of lives of seriously ill patients.