METATRON DEVICE USE IN THE ONCOLOGICAL PROCESSES DIAGNOSTICS

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During last few years there was a strong development of all kinds of hardware diagnostics used in oncology. Such technologies include traditional X-ray examination with its methodic varieties (rontgenoscopy, rontgenography and others), ultrasonic diagnostics, computer tomography (CT) and magnetic resonance tomography (MRT), traditional angiography, different methods and techniques of nuclear medicine, and NLS method which is widely used in oncology with the help of Metatron system. Mutual vectors of that kind of developments are: increasing of NLS technologies hardware significance and difficulty and also individual devices; general integration of this method along with different technologies for diagnostics problems solving in the context of single anatomical region, system or pathology.

In oncology NLS diagnostic is oriented mainly for solving fundamental problems which are oncological diseases pre- revealing, their nosologic diagnostic, staging and cure results oversee. In the present days we can talk about forming of NLS-diagnostics special tendencies which are realized on various stages of oncological treatment and demand all sorts of organized, technological and technical approach. Such as:

1. Early (pre-clinical) new growths diagnostics or oncological diseases screening;

2. Pathological organs and tissue changes evaluation using noninvasive NLS-technologies;

2.1. Diagnostics and differential diagnostics of discovered pathological growths, particularly oncological and non-oncological diseases, anatomical and functional peculiar properties process determination;

2.2. Cancerous growth staging including traditional oversee of primary growth prevalence, regional lymphatic nodes metastasizes and distant metastasizes;

2.3. Results of surgical, medicinal and radiation therapy oversee, including the factual change of tumor tissue, and complication and reactions that appear in the course of healing;

2.4. Patients case monitoring after treatment.

The solution of every abovementioned task can be used in specific pathological process which also requires combined use of NLS-diagnostic and various ray technologies. Principle of sequential advancement from simpler technique to more complicated using NLS-diagnostics dominated in last years, now fundamentally another method is widely spread. It is about choosing the most effective including most expensive methods or their combination for the best and fastest results.

During last years the typical example in this sphere of business is the three-dimensional reconstruction images of tissue tumor based upon the results of multivariate NLS-scopy using Metatron of Z-series high-speed nonlinear multivariate scanners and Hunter diagnostic program in combination with computer and magnetic resonance tomography for tumor process prevalence oversee in the whole organism. This kind of approach inevitably leads to serious structural changes as in diagnostic itself and in oncological practice as a whole.

Oncological diseases screening. Screening as an organized measure is aimed towards person's disease exposure who have no clinical signs of the disease itself and who have no reasons to seek medical care. Mass NLS-research activities with the purpose of oncological diseases early diagnosis always had a number of supporters and opponents. It is caused by the fact that exposure of tumor in pre-clinical stage does not always correspond to the term "early diagnosis". In the present days there are some stated basic requirements to every oncological screening program, including the ones based on NLS-technologies;

- the disease must be enough-spread and have high social implication;
- NLS-diagnosis method is essential to expose the disease in preclinical stage;
- There should be an opportunity to cure an exposed disease with the help of existing techniques;
- Screening should bring to decrease death-rate caused by stated disease in population;
- Screening should be economically sound i.e. the outlays for early diagnosis should be lower than patients treatment costs, who sought medical care with clinical symptoms.

Abovementioned principles are successfully realized now only in single screening program based on NLS-technology use – telemedicine monitoring by means of hardware-software «Metatron TorDi» complex. Remarkable opportunity of this system is diagnostics sensibility heightening and system functional possibilities widening due to ensuring of technologically remote diagnostics (telediagnostics) in doctor's and patient's asynchronous contact mode when they can communicate without any territorial distance limitations.

The assigned task is solved due to distant telemetric torsion monitoring system using monitoring of indexes of patient's status by medical personnel.

The effectiveness of oncological diseases screening nowadays cannot be doubted. During the last years main discussions about these programs individual aspects were spread, in particular:

- ✓ Age limits, when it is appropriate to start and finish screening procedures, its dependence upon national peculiarities;
- ✓ The possibility of NLS use for cancer of various localization evaluation;
- ✓ The status of technology in primary and qualifying oncological diseases diagnosis.

It should be noted that in Russia there were no telemedicine screening processes applied to this very day, because of lack of funds for this kind of programs, lack of equipment and qualified personnel in the majority of regions and insufficient methodical-organizational telemedicine screening engineering system.

Along with telemedicine screening there are other pre-clinical diagnostics programs that develop intensely, such as early cancer of lung exposure using virtual multivariate NLS-scopy, large intestine cancer based upon virtual multivariate NLS-scopy in combination with CT or MR – colonoscopy. Among them the most important results are received in the cancer of lung case study early-diagnosis.

Modern perspective diagnosis programs for studying the possibilities of bronchogenic cancer screening are based on virtual spiral NLS using. In comparison with rontgenography and fluorography the main advantage of this technology is fundamentally high resolution. Using virtual NLS allows effective exposure of nidi in lung tissue sizing 0,5-0,7 mm. In most of major researches it is shown that virtual NLS allows revealing lung nidi of 10-12% patients from high-risk group, where 0,5 - 1,5% are bronchogenic cancer. More than 80% of these tumors are not seen while rontgenography, resolution limit of which is 3-5mm. NLS can expose cancer at first stage of 80-95% of patients.

The main limitations for virtual NLS-scopy of bronchogenic cancer screening wide application are high number of false-positive results, the lack of conclusive proofs in decreasing of patients death rate in screening groups compared with other groups or population as a whole.

New malignant neoplasms diagnosis and staging.

During last years there have been some evidences of NLS-technologies rapid development that are aimed at diagnosis and new growth staging procedure of various localization. Multilayer spiral computer NLS-scopy was a breakthrough in clinical use of all hardware technologies. The use of NLS-scopy method allows realizing of two main advantages of this technology: to increase scan speed and spatial resolution. Scanning speed increase is proportional to the amount of used parallel processors amount. Compared with NLS-systems of previous generation of Oberon systems, using of LAPP system (4 parallel super computing power and performance processors system) allows decreasing 8 times the scanning interval of given anatomic area. In practice for example it means the possibility of belly or breast examination for 3-5 seconds. Speed increasing allowed simultaneous examination of several anatomical areas: breast, belly, head, neck and the breast's upper half which has enormous significance in oncologocal practice. Extremity examination became possible including long bone, single or couple spinal sections which was only available before using MRT.

The second advantage of NLS-diagnostic is lessening of the scanned area as a result of maximum possible increase of spatial resolution. When using Oberon systems there was the possibility to investigate ultrastructure with minimum size 100-200 microns, and using Metatron system allowed the examination of 5-10 microns. This technology gives an option to expose that sized of pathological growths. In clinical practice they usually choose from maximum possible research speed and maximum possible resolution in given conditions.

The increase of resolution has another vital significance. So called isotropic images are formed when layer thickness is 5-10 microns. In this case the image

matrix consists of voxels which have equal or nearly equal edges (have cubic shape). The resolution along axial and longitudinal plane is equal which permits building-up of factual two- and three-dimensional conversions of examined area at the end of examination.

NLS application in clinical practice allowed significant increasing of angiographic studies which are based on selected anatomical area scanning at the moment of vessels contrast medium bolus passing. In combination with various methods of virtual transformations it allows studying vessels inner lumen, thrombus exposure; oversee vessels and pathological neoplasms relations. There are virtual NLS-scopy technologies that intensively applied in oncological practice particularly colonoscopy, angioscopy, bronchoscopy, perirhinal sinus endoscopy and so on.

NLS rapid evolvement is characterized by the systems with brand new software («Metapathia GR Hunter» program). The main tendency here is in gathering information time decrease for making adequate researches. The other NLS line of development is Z-series scanners using of which allow several anatomical areas examination in the course of single research lasting 10-15 minutes. The most demonstrative in that case is the whole organism NLS-research, which is aimed at primary tumor search or individual metastatic organ or tissue affection.

NLS significance constantly increases thanks to equipment upgrade and oversee of functional condition and various organs and systems standard medications. At present time oncology along with cardiology turns up to be this technology's one of the main supplementary positions. Numerous researches such as those of prospective and retrospective methods have shown that NLS appears to be one of the most effective ways to reveal malignant tissue. If sensitivity and specificity indexes CP and MRT make up in total 60-90% of different localization neoplasms exposure, then similar NLS indexes practically in all researches exceed 80%. At the same time minimal pathological neoplasm sizes that were revealed by NLS were 0,3-0,5 mm. NLS has base value in differential diagnostics of cancerous and non- cancerous growths, primal tumor exposure in cases with various organs and tissues metastasis affection, prevalence of primal tumor determination while having unknown metastasis in regional glands and distant organs. In all abovementioned clinical cases NLS' self-descriptiveness turns up to be beyond of all morphological visualizations of traditional technologies.

Main NLS disadvantage is as in most hardware methods is difficulty of exposed pathological growths precise topical diagnostics, impossibility of tumor and its surrounding tissues and organs relations determination. For this purpose they use CT nowadays. The appearing of combined NLS/CT using has become natural which allows making two researches practically simultaneous with following anatomical CT and virtual NLS-images color registration. Expediency of this concept in diagnostics is widely argued now.

Thus NLS-diagnostic modern technologies have high profile in oncological practice providing precise and timely data concerning tumor process presence and prevalence.