CERTAIN ASPECTS OF NLS-DIAGNOSTICS OF LIVER FOCAL PATHOLOGY

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Recently role of non-invasive diagnostics methods becomes more and more important. New systems, such as «Metatron» system of last generation, appear; this system has great potentials in differentiation of pathological processes, including those at liver diseases. Modern expensive diagnostics equipment can be afforded only by large clinical and scientific centers, but relatively small medial departments may allow themselves to have equipment combining reasonable price and rather high diagnostic potentials. Optimal choice in this case may be computer NLS-graphy by means of «Metatron» system. Not only accurate and well-timed diagnostics of disease has great importance, but also there is need to keep up certain financial limitations. In some cases, especially at planning of surgical intervention, NLS-graphy seems to be more reasonable than radiologic computed tomography (CT). NLS-method makes possible to use multifunctional program that allows therapists to carry out consecutive updating of affection character during one and the same examination.

At the same time many types of pathology are diagnosed even during properly carried out NLS-examination. Often patients come for CT or MRI without results of NLS-examination, but at the same time if it was carried out before, it could ease, in many aspects, tactics of further examination and optimization of offered methods.

In this article we would like to examine rational application of diagnostics equipment depending on detected symptoms of one or another disease of liver. In the first place it concerns focal diseases, which for the long period remain clinically «mute». Almost every visualizing study makes possible to detect focal masses in liver parenchyma, obstruction of biliary tracts, hepatic vessels and inferior vena cava, but diagnosis updating is the prerogative of one or another method (ultrasound, CT, MRI or NLS).

Choosing of visualization method (depending on potentials) should be started from history taking and evaluation of patient’s external status. So patients with body weight of more than 120 kilograms, with presence of foreign bodies (gunshot or missile wound, metal clips after surgical interventions, etc.) with heart pacemakers and those suffering from claustrophobia cannot be administered to MR-imaging. For some patients (especially in pediatrics) radiation dose should be decreased. There are no contraindications for NLS-examination. Small sizes of neoplasms (less than 0.5 cm) allows to identify their character and do not require additional CT or MRI.

Having data of previous studies, one need to identify diagnostic value of future examinations, deciding if one or another examination will be enough.
The most frequent unexpected finding after examination and the object of further diagnosis verification is liver hemangioma.

Hemangioma is a benign vascular neoplasm of liver (prevalence in population is up to 15%). Having heterogeneous internal structure, their visual picture may resemble cancer (especially at ultrasound and CT), which requires additional diagnostic investigations. In majority of cases hemangiomas are clinically asymptomatic.

Diagnostic criteria of hemangioma (according to MRI, CT and NLS data) are considered to be the following: it is never encapsulated, edematous, is drawn towards hepatic veins, sometimes its form is close to form of hepatic lobes. Its outlines may be of irregular form, but distinct. Dynamic study detects very slow growth.

At NLS-examination hemangioma often visualized as hyperchromic (4 – 5 points according to Fleindler’s scale) neoplasm. However if there is corresponding fatty infiltration of liver present, hemangioma acquires hypochromicity and sometimes it is hard to differ it from cysts or metastases. Cavernous hemangioma is represented by hypo- and achromogenic areas (1 – 3 points), which complicates its interpretation. Hyaline fissure, one of the most typical symptoms of hemangioma, not always can be revealed.

It should be noted that if there is possible hemangioma, puncture cannot be administered due to high risk of haemorrhage development. It requires dynamic monitoring of a patient and repeated examinations.

Cyst may often be an unexpected finding during examination on another occasion. At NLS-examination simple cyst may have certain diagnostic symptoms, according to which it may be successfully diagnosed. It has roundish form, distinct outlines, hypo- and achromogenic (1 – 2 points) content. Sometimes cyst wall may resemble capsule; detected heterogeneity of internal content or multichamber character may complicate diagnostics.
If neoplasm with thick wall or heterogeneous internal content is detected, it is reasonable to carry out CT with contrast enhancement. Cyst will not be contrasted. Complicated cysts are accompanied by increasing of densitometric indices and appearance of air bubbles inside cyst, which may be easily detected by CT. Application of CT is reasonable in cases of unknown organ belonging of cyst, visualized by NLS in liver area. In fact, cyst visible in liver area, may be cyst of adrenal gland, mesentery, etc.

Hepatic hydatid at NLS-research shows a number of certain characteristics, differing it from other cyst-like neoplasms. These are roundish form, smoothness of outlines, visualization of satellite beads. Chromogeneity of cyst decreases after parasite death. Final argument in diagnostics of hepatic hydatids is high spectral similarity with (D<0.425) «Echinococcus granulosis» etalon.

If NLS-examination cannot render all signs of cyst or the examination seem to be of low information value, both MRI and CT may be recommended as high information valuable methods at this pathology.

Liver abscess is quite rare focal affection of liver, characterized by local accumulation of suppuration in its tissue with disintegration of parenchyma and stroma. Abscesses may be a result of cholelithiasis complications, drawing towards localization in right lobe of liver and having large size, in majority of cases. Typical signs of biliary abscess are small sizes and multiplicity of foci. Visual picture of liver abscess is not always specific; at the same time clinical symptomatology allows to suspect this exact pathology.

At NLS-examination a therapist may detect thick hyperchromic capsule and heterogeneous internal content of neoplasm. At visualization of fanciful forms and heterogeneity of internal structure, accuracy in diagnostics may be achieved by CT using.

At forming of abscess cavity, NLS-examination detects moderate chromogeneity in the center of focus (3 – 4 points according to Fleidler’s scale).

At the same time we detected gradual (crateriform) density heterogeneity from peripheral areas to the center. Diagnosed focus does not have strict distinguishing from surrounding parenchyma. Heterogeneous lobulation is visualized, air bubbles looks like hypochromic dots in abscess cavity. Final argument is high spectral similarity (D<0.425) to «Liver abscess» etalon. According to some authors, diagnostic reliability of NLS in case of abscess approaches to absolute.

Liver adenoma relates to benign tumors, originating from hepatocytes. It may be anamnestically detected that it is related to taking of peroral contraceptives. More often this pathology is detected in young women. Sometimes it may be diagnosed in men, who use androgenic or steroidal agents. Adenoma diagnostics is very important due to high risk of hemorrhage development, rupture, malignant transformation or need in surgical intervention.

Histological heterogeneity of adenoma (haemorrhage, necrosis, fatty infiltration, central cicatrisation, encapsulation and development of large intratumoral vessels) results in visual picture of heterogeneity at both NLS and MRI and CT; this sign is a distinctive trademark of this pathology. In 30% of cases happens encapsulation of adenoma similar to development of pseudocapsule. Adenoma size ranges from 1 to 19 centimeters (average 5.4 cm). Adenoma may be both singe and multiple. It has distinct outlines. Differing from hemangioma, adenoma is not drawn towards localization next to hepatic vessels and it does not take whole lobe. Malignant neoplasms are more heterogeneous and poorly outlined.

NLS-examination may display signs of liver adenoma when it detects rounded neoplasm with distinct outlines, moderately hyperchromic (4 – 5 points) internal structure,
intratumoral vessels and surrounded by hypochromic ring. As usual, the most important issue in diagnosing is high spectral similarity to «Liver adenoma» etalon.

MRI-signs of adenoma are: good outlined heterogeneous neoplasm, surrounded by ring, more often hyper-intensive, sometimes with focus of hypo-intensive hemorrhage in the center, with corresponding central cicatrisation, heterogeneously contrasting in arterial phase.

Abovementioned characteristics (heterogeneity of structure, pseudocapsule, hyper-intensity at MRI pictures) once again emphasize difficulty of adenoma differentiation, especially from hepatocellular carcinoma.

If there are signs of adenoma one can choose either NLS-examination or MRI of liver.

**Hepatic adenoma. MR-image. T2-weighted picture**

**Hepatic adenoma. NLS**

**Focal nodal hyperplasia of liver (FNH) –** is quite rare benign tumor, in majority of cases diagnosed in women of fertile age. FNH is single, rounded, non-encapsulated neoplasm with irregular hepatic architectonics, divided by septa reaching central cicatrice. Average size of focus is 5.7 centimeters (from 1.5 to 12.0 cm).

At NLS-research FNH may look like neoplasm of irregular form with diffuse microfocal heterogeneity and absence of capsule. Often hyperchromogenic nodes are detected, but chromogeneity may be of any kind.

FNH has a wide spectrum of MR images. The most typical are considered to be homogeneity and isointensity. Characteristics of central cicatrice have special diagnostic value.

Intratumoral cicatrice has complex structure and knowing of its histological characteristics contents (biliary ducts, blood vessels and cells intrinsic to chronic inflammation) helps to interpret properly MRI acquired data.

The most rational diagnostic method in presence of FNH or liver adenoma signs, we consider to be initial NLS-research of abdominal cavity organs and further MRI with contrast enhancement in order to update a diagnosis. CT has not so great diagnostic value.

Specific diagnostic problems may appear in patients with cirrhotic changes in liver, especially at appearance of liver tissue regeneration nodes, which are poorly differentiated from possible malignization foci. NLS-research accurately detects liver cirrhosis, however when we use spectral-entropy analysis, differentiation of hypochromic or isochromic regeneration nodes from malignization foci nor always possible, because the latter relate to catabolic processes, poorly diagnosed by NLS-method.

CT perfectly detects typical signs of liver cirrhosis: decreasing of liver size, uneven outlines, disproportion of lobes sizes and dilation of intrahepatic connective tissue spaces.

Hepatocellular carcinoma (HCC) is the most widely spread among primary malignant hepatic neoplasms. In 50% of cases it is single, in 15% – 20% – multiple and in 30% – 35% – diffuse. Neoplasm may be both encapsulated and not; its size differs from 6 to 20 centimeters.

NLS-examination data is quite specific – it is heterochromic, more often hyperchromic (5 – 6 points according to Fleindler’s scale) neoplasm with indistinct outlines, sometimes surrounded by hypochromic ring. It is the result of changed architectonics vascular structure, dilatation of large vessels and presence of blood clots in them. Problems in diagnostics may appear at carrying out of spectral-entropy analysis of blast processes, because intensively growing tumors without necrosis foci and tissue disintegration, as any catabolic processes, poorly diagnosed by NLS-research method, due to physics of quantum-entropy interactions.

Diagnostics of metastases into liver is also very important. Analysis of detected metastatic disease foci according to high information valuable methods (MRI and CT) proven, that sometimes NLS-research carried out after tomography detected not all, even well-known,
foci of localization. Presence of different in structure foci is typical exactly for metastatic affection of liver. Potentials of liver metastatic affection detection are significantly extended by CT and MRI with contrast enhancement. Cystic-necrotic neoplasms in liver are more successfully diagnosed with NLS-method. Diffuse infiltrating metastases, as a rule, are diagnosed poorly by NLS-examination; they may resemble diffuse diseases of liver. In some cases one has to use puncture biopsy of liver to confirm diagnosis.

Need in CT or MRI for patients with signs of metastatic affection of liver is obvious.

In conclusion we would like to emphasize that within NLS-method, new and more information valuable methods are being developed. Application of continuous spiral scanning, spectral-entropy analysis, three-dimensional visualization in many aspects improves diagnostics of both malignant and benign neoplasms, approaching accuracy of diagnosing to 81%. Cost of NLS-researches is considerably lower than cost of CT and MRI. Recently, diagnostic role of ultramicroscopic evaluation of chromosome aberrations, detected by ultrahigh-frequency generators (40 GHz), especially in cases of metastatic disease, becomes more and more important. Therefore, diagnostic process in every case is individual and must be based on numerous generalized data of all carried out researches. At the first stage of diagnostics NLS-examination (especially dynamic one) is preferable and further choice of high information valuable expensive methods is advised to carry out depending of acquired from previous examinations data.