Sonoelastography (SEG) of cancer-involved cervical lymphatic nodes in their different morphological verifications

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Aims and objectives

Nowadays evaluation of the condition of different lymphatic nodes remains the very controversial question of clinical medicine. According to Gritcman's data, the palpation has sensitivity 69%, specificity 87% and accuracy of 80% for metastasis detection in cervical lymph nodes. Ultrasound diagnostics has values 92%, 84% and 89%, respectively [4].

Alam et al. (2008) report high diagnostic informativity of sonoelastography in differential diagnosis of benign and malignant processes in enlarged lymphatic nodes. The compression elastography uses a technology that allows to evaluate tissue elasticity with the direct compression or distantly. Results can be expressed in digital values. However, the data about SEG efficacy in early and differential diagnosis of lymphatic nodes involvement in metastatic processes are rather controversial (N. Fukunari et al. (2009)). SEG is the effective technology in early and differential diagnostics of lymphatic nodes involvement, with higher specificity and diagnostic accuracy than Color Doppler Mapping (CDM). The using of B-regime and SEG in complex significantly increase diagnostic accuracy of the technology.

According to these, introduction and improvement of the latest methodics and technologies in the sphere of US allow to objectify the data about tissues physical density and elasticity, due to introduction of SEG. This methodic opens technical opportunities for searching of the new diagnostic criteria for diagnosis of lymphatic nodes involvement and determines the role of SEG in patient's complex radiological diagnostic survey.

Few publications evaluating the informativity of this method are rather contradictory. This can be related to the lack of the standardized approaches to SEG and also to the lack of unified criteria for the differential diagnosis [2,3,5-9].

The aims of the study: was to determine diagnostic visualization features of cervical lymphatic nodes pathology in patients with the different tumors.
Methods and materials

316 patients of the N.N. Petrov's Research Institute were enrolled in the study from July, 2011 until December, 2012 (age 18-82; male - 215; female - 101). Of the patients - 149 had cancer-involved lymphatic nodes (mean age 58,0±7.9, male - 84, female - 65). Firstly, the involvement of the lymphatic nodes was evaluated with the palpation performed by the professional oncologist. After that the further analysis was performed on the data of US and morphological (cytological and histological) evaluations.

Morphologic evaluation was obtained on the results of cytodiagnostic fine-needle biopsy and the results of surgical histological examination. The elasticity of the image in compression SEG was represented as the color mapping, where the most dense tissues were matched with the blue color, less dense - with the green and yellow and liquid areas with the three-layered red-green-blue color. All results were recorded on a hard drive for further processing.

The modified Ueno classification (University Tsukybo, Japan) of the lesion's density was used for a qualitative assessment, in which the first two density types displayed the benign nature of lymphatic nodes changes, the third - the borderline type (with the requirement of the FNAB); 4 - the malignant type, 5 - three-color type, with the possibility of malignant process, but with the elements of nodular necrosis, predominantly containing fluid. The deformation coefficient was determined by the ratio of densities of the involved lymphatic nodes to the cervical subcutaneous fat tissue.
Results

In this study the following criteria of cervical lymphatic nodes involvement were determined: the anterior - posterior size of the nodes exceeding 10 mm, the rounded shape, the illegible, uneven contour, the changes of the cortical layer, the lesions of the gate differentiation and pathological inclusions in lymphatic node's structure (Tabla 1.).

Evaluation of lymphatic nodes was held for all patients according to extent and ratio of sealing to normal tissue (cervical subcutaneous fat). The modified Ueno classification (University Tsukybo, Japan) of the lesion's density was used for a qualitative assessment, in which the first two density types displayed the benign nature of lymphatic nodes changes, the third - the borderline type (with the requirement of the FNAB); 4 - the malignant type, 5 - three-color type, with the possibility of malignant process, but with the elements of nodular necrosis, predominantly containing fluid. Strain ratio #2 was considered suspicious for the malignant process. Values of sensitivity, specificity, accuracy were determined as 79.6%, 84.9% and 81.0%, respectively. Histopathological results and clinical data (including MRI data) were considered as the controls to the sonoelastography data.

The two groups were matched: the group of patients with the generalized systemic tumors (n=54) and the group of patients with the solid tumors (n=95).

The decreased echogenicity of cortical layer with echogenic linear structures in B-regime was typical for the involved lymphatic nodes in the patients of the first group. The affected lymphatic nodes were mapped in mosaic density with the presence of relatively soft structures (blue-green color) of the strain ratio (SR) - 2.9±2.1 (Fig.1). In this group lymphatic nodes morphologically were verified as affected by malignant lymphoma or skin melanoma.

In the second group the lymphatic nodes in B-regime the cortical layer was with heteroechoic inclusions because of the presence of dense hyperechoic structures and microcalcifications. By SEG lymphatic nodules were mapped in completely dense structures (blue color) and SR was 4.4±8.6 (Fig.2). Morphologically these lesions were verified as the metastasis of squamous cell carcinomas (nasopharyngeal and the carcinoma of the tongue), the adenocarcinomas of the lung, the papillary and the follicular thyroid carcinomas.
Conclusion

The data of SEG can be used in differential diagnosis of the etiology of metastatic cervical lymphadenopathy in generalized and solid tumors at the initial patient’s examination. The criteria for selection of patients for the first-time fine-needle aspiration biopsy (FNAB) for the confirmation of the diagnosis and the selection of further treatment strategy were created.
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