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Role of Ultrasound in the Diagnosis of Superficial Lymphadenopathy of the Neck

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Abstract--- *This article presents the results of ultrasound in B-mode and color Doppler mapping with spectral characteristics of 53 patients with head and neck diseases with metastatic processes in regional lymph nodes. The described ultrasound criteria made it possible to assess the nature and degree of damage to the neck lymph nodes, which significantly influenced the choice of further treatment tactics.*

Keywords--- *B-mode, Dopplerography, Color Doppler Maping, Lymphadenopathy, Metastases, Ultrasound Diagnostics.*

I. INTRODUCTION

An urgent and rather complex differential diagnostic problem for doctors of various specialties is lymphadenopathy (*LAP*) - a condition manifested by an increase in lymph nodes (*LN*) of any nature, while the term is exclusively generalizing. The term lymphadenopathy is used when discussing a differential diagnosis, to indicate cases when the diagnosis has not been established for various reasons [1]. The relevance of this work is due to the variety of nosological forms accompanied by lymphoproliferative syndrome, as well as the complexity of the differential diagnosis of benign and malignant lymphadenopathies [2,3]. Standard ultrasound examination in seroscale mode on modern equipment remains the leading method of ultrasound examination of peripheral lymph nodes, it has high accuracy and sensitivity [4,5]. This is a fairly simple diagnostic method with low cost and without radiation, which is widely used for the diagnosis of pathology of superficial lymph nodes. Ultrasound currently provides high resolution and is preferred when determining the morphological details of the lymph node compared to computed tomography [6].

Purpose

To study the differential diagnostic criteria of superficial lymph nodes of the neck using ultrasound ultrasound in *B*-mode and echodoplerography.

II. MATERIALS AND METHODS

A prospective ultrasound examination of the superficial lymph nodes of the neck was performed in 53 patients with diseases of the head and neck. Among them, men were 31 (58.5%), women - 22 (41.5%). The average age of the patients was 57.2 years. In all cases, the diagnosis was verified and occupied various locations: laryngeal cancer

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- 43%, thyroid cancer - 27%, tongue cancer - 21%, oral mucosa cancer - 9%. Ultrasound investigation was carried out using high-frequency linear sensors of 7.5-10 MHz on Mindray *DC7* and Logiq *S8* (*GE*) devices.

The study of the lymph nodes of the neck began in standard B-mode in the following topical areas: accessory (including the region of the angle of the lower jaw), parotid, chin, submandibular, supraclavicular. Then, in the regimes of color and energy Doppler mapping, the qualitative characteristics of blood flow in the lymph nodes were determined. When using the spectral mode, it was possible to evaluate the quantitative indicators of blood flow (determination of velocities, as well as the pulsation index). The criteria for assessing the lymph node were: shape, contours, sizes, **LONGITUDINAL/ANTEROPOSTERIOR** ratio, the presence of differentiation into the cortex and gate, echogenicity, echostructure, as well as the nature of vascularization.

It should be noted that all patients underwent a preoperative puncture biopsy, and, if possible, surgical intervention was performed histological examination of the removed collectors of the lymphatic apparatus.

III. Research Results

Using detailed ultrasound imaging in 53 patients, 162 lymph nodes were detected. Of these, 98 (60.1%) were regarded as metastatic and 64 (39.5%) as reactively altered. After a puncture biopsy of the studied lymph nodes, in 18 (11.1%) cases there were false-positive results, in 11 (6.8%) - false-negative.

In a comparative study of the semiotics of reactively altered and metastatic lymph nodes, a number of differential diagnostic criteria were identified. So, in 60 (93.8%) of the reactively changed lymph nodes, an oval or flattened shape was determined, in all cases the contours were smooth and clear. In 100% of cases, the dimensions did not exceed 15 mm and the ratio LONGITUDINAL/ANTEROPOSTERIOR ≥ 2. In almost all cases, the differentiation of the cortex and gates of the lymph node was clearly defined, in 49 (76.6%) cases increased echogenicity of the cortex was observed, and in 15 (23.4%) it was reduced. The echostructure of 62 (96.9%) lymph nodes was homogeneous (Fig. 1).

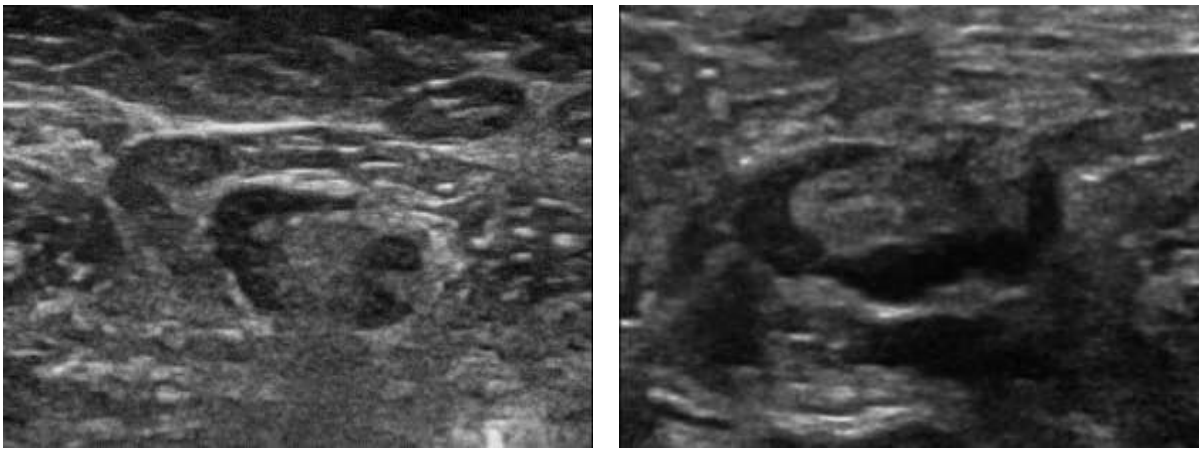

Fig. 1: Echograms Show Reactive Lymph Nodes in B-mode

In CDM, blood flow was mainly localized at the gates of 52 (81.2%) lymph nodes, 8 (12.5%) lymph nodes were avascular, and in 4 (6.3%) cases, single color loci were noted along the periphery of the node (Fig. 2).

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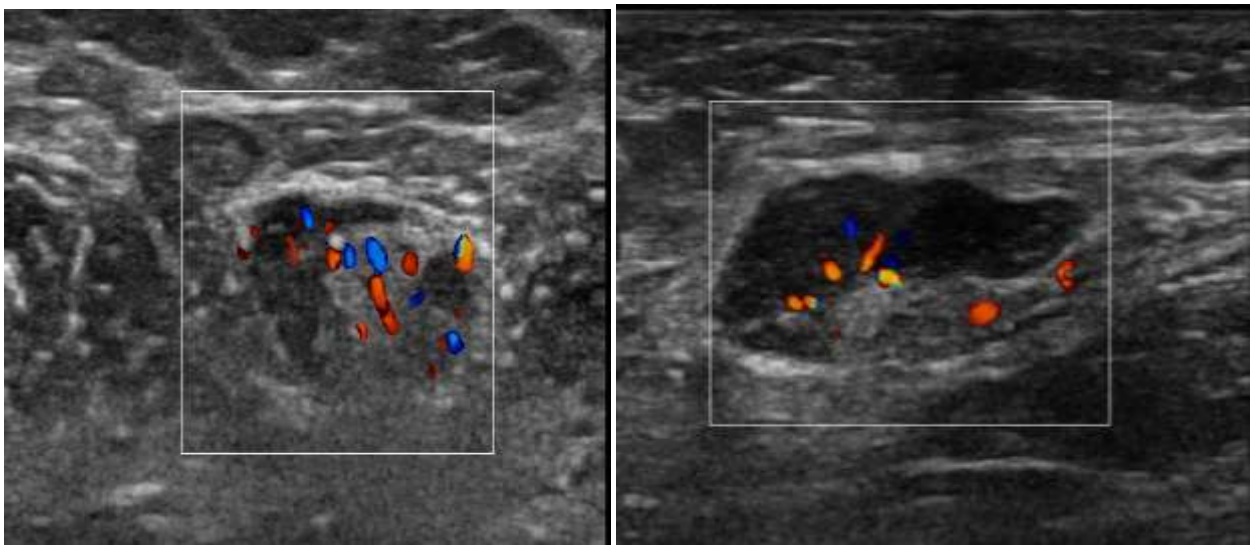

Fig. 2: Reactive Lymph Nodes are Shown on Echograms with color Doppler Mapping

Enlarged sizes (more than 10 mm) were observed in 91 (92.9%) metastatic lymph nodes. Their shape was mainly round and oval (88.6% and 11.4%, respectively). Contours in 71.4% were clear, uneven, in other cases uneven fuzzy contours were observed (Fig. 3).

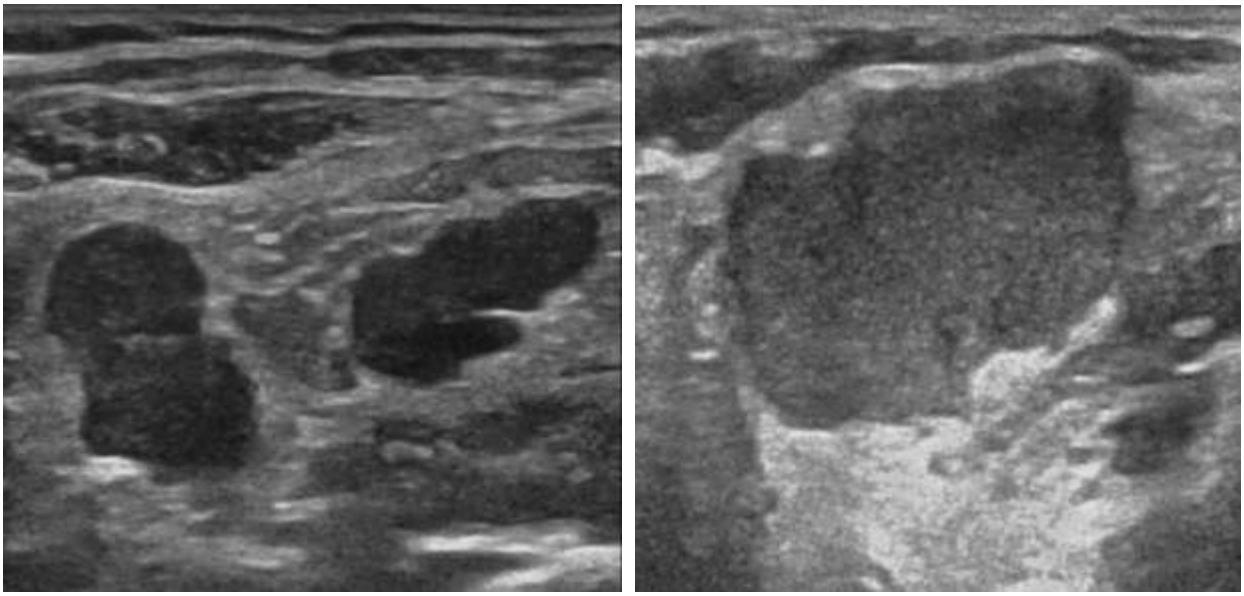

Fig. 3: Echograms Show Metastatic Lymph Nodes in B-mode

A clear differentiation of the cortical layer and gate was observed in 17 cases (17.3%), hypoechoicity and heterogeneity of the structure of the nodes were visualized in the remaining lymph nodes. CDM made it possible to determine the presence of blood flow of predominantly perinodular nature in 74.5%, the remaining lymph nodes were with single color signals both in the center and in the cortex. In 4 cases, blood flow was not determined (Fig. 4).

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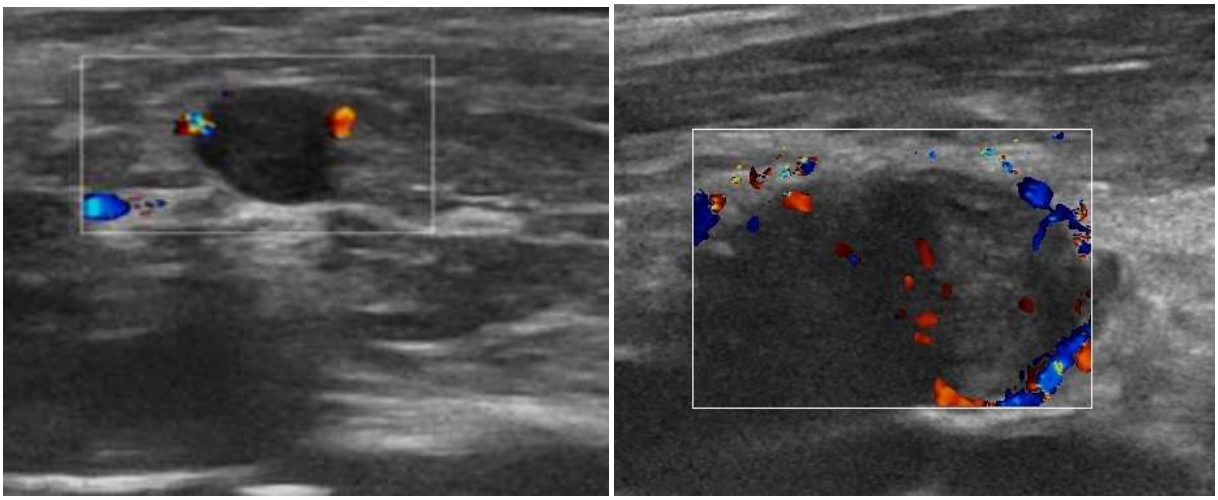

Fig. 4: Echograms show Metastatic Lymph Nodes with Color Doppler Mapping

Quantitative indicators of dopplerographic studies of blood flow in the lymph nodes in the spectral mode are presented in table-1.

Table 1: Hemodynamic Parameters of Blood Flow in the Vessels of the Lymph Nodes (n=150)

Blood flow	*Metastatic lymph nodes*	*Reactive lymph nodes*
V_{max}, m/sec	0,59±0,44	0,24±0,24*
V_{min}, m/sec	0,19±0,16	0,10±0,14**
PI	0,53±0,01	0,72±0,03**

Note: * – reliability of data between groups (* - P<0,05; ** - P<0,01)

As can be seen from the table, with metastasis of the lymph nodes, the blood flow velocity in them increases by 2 times against the background of a decrease in PI (P <0.05). The reverse picture was observed in reactive lymph nodes, the blood flow rate decreased, and PI was within the standard values (Fig. 5).

So, the sensitivity of ultrasound diagnostics of lymphadenopathy in the triplex mode was 95.2%, specificity 88.0%, accuracy 91.7%.

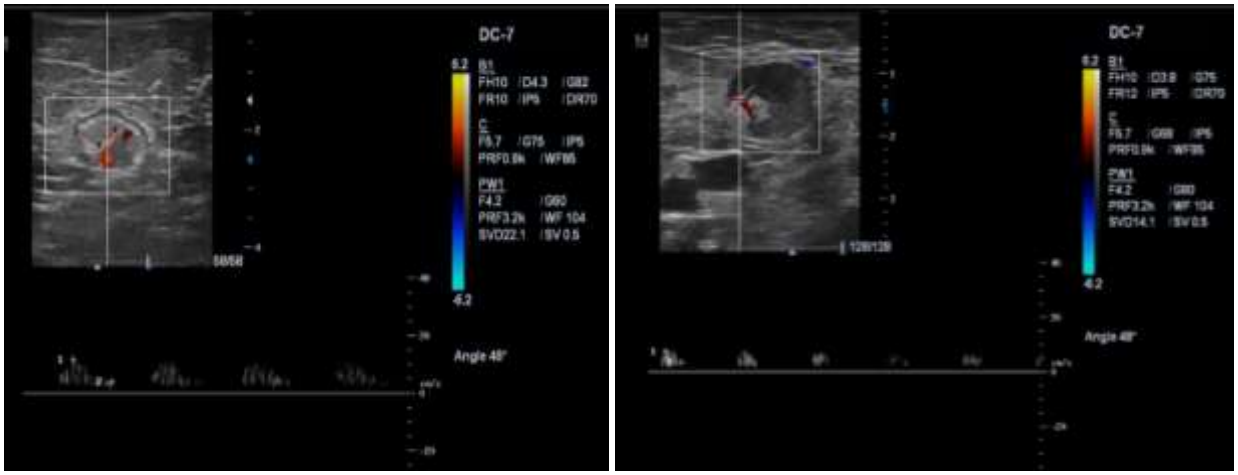

Fig. 5: The Echograms Show the Lymph Nodes of the Neck in Triplex Mode

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IV. DISCUSSIONS

Despite the fact that the diagnostic effectiveness of ultrasound diagnostics in assessing the lymph nodes of the neck has been studied by many authors, nevertheless, this issue remains relevant and debatable today. So, according to Wu C.H. (2010) with co-authors, the sensitivity of ultrasound diagnostics of the lymph nodes of the neck was 89%, specificity 87%. In the works of M. Ghafoori et al. [7], where the lymph nodes of the neck (47-lymph nodes with metastases and 57 without metastases) were examined in 63 patients, the results differ from the works of other authors. The sensitivity of ultrasound in B-mode in combination with dopplerography was 74%, specificity was 96%.

When analyzing the results of a study evaluating the possibilities of ultrasound in the diagnosis of metastatic lesions of regional lymph nodes in malignant tumors of the head and neck, specialists of the Russian N. Blokhin Russian Oncology Center it was proved that the sensitivity of the ultrasonic method was 96.4%, specificity - 91.0%, accuracy - 94.0% [8].

Undoubtedly, the final diagnosis of lymph node pathology should be based on a comprehensive analysis of clinical data and the results of instrumental and laboratory studies. As a non-invasive and highly informative method, ultrasound research plays an important role in this diagnostic algorithm. [9, 10].

V. CONCLUSION

B-mode ultrasound in combination with dopplerography is a highly informative differential diagnostic method for detecting the pathology of peripheral lymph nodes. Triplex scanning can be used for screening, primary diagnosis and dynamic control during the treatment of this category of patients both in outpatient conditions and in a specialized hospital.

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