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Ultrasound Diagnostic Technique of Hypertrophy of Pharyngeal Tonsils in Children

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Abstract: Although ultrasound is one of the most convenient methods in diagnosing diseases of the organs located in the neck area, its application in practice is not yet widespread. There are a number of important advantages of this method over other diagnostic methods, such as high accuracy and specificity, the ability to detect even small changes in the organs, non-invasiveness of the study, painlessness, no need to use drugs, ease and absence of ionizing radiation.

Keywords: pharyngeal tonsil, ultrasound examination, children, adenoids, lymphatic tissue.

Introduction. Currently, the main causative agents in the development of major otorhinolaryngological diseases such as hypertrophy of the pharyngeal tonsils and adenoiditis (inflammation of the pharyngeal tonsils) are bacteria and viruses [1,6,9]. The diagnosis of pharyngeal tonsils hypertrophy is usually based on conventional epipharyngoscopy data. In addition, there are new methods for easy determination of the degree of hypertrophy of the adenoids, and they are able to provide more complete information [2,6,8].

Today, no specific recommendations have been proposed for ultrasound examination of the pharyngeal tonsils and its indications in children of different ages with adenoid hypertrophy [6,9,11]. Accurate, reasonable and well-organized diagnosis of nasopharyngeal diseases allows to prevent many complications of ORL diseases or their development in the early stages of the disease, so early diagnosis requires a special and unique approach [8,11].

There are currently several methods for diagnosing hypertrophy of the palate and pharyngeal tonsils, but they have a number of shortcomings, for example, the inconvenience and difficulty of the examination process for both the patient and the doctor, the impossibility of practical application, sterile conditions and disposable instruments. - The need to have equipment, the impact of additional or related diseases (gastrointestinal tract, facial and maxillofacial pathology, laryngopharyngeal reflux, etc.) and the pathological features of the structure of the pharynx on the results of the study [5,6].

Nowadays, there are common methods of diagnosing hypertrophy of the pharyngeal tonsil and chronic inflammatory diseases of the nasopharynx during life [1,7,9]. According to Yasan H., Aynali G., Erdogan O., Yariktash M., (2011), the active resistor is placed under the tongue along the midline of the passive electrode, and the active electrode is placed on the right and left tonsils at the midline, respectively. is studied by placing. However, in patients with chronic tonsillitis, an increase in active resistance values and a decrease in polarization dispersion coefficients are observed at frequencies of 1 and 100 kHz, and even these values are almost unchanged in the hypertrophy of the tonsils [11]. The disadvantages of this method are that during the treatment it is necessary to use electrodes in the mouth and nasopharynx as well as the fact that morphofunctional changes in the mucous membrane of the oral cavity and nasopharynx can affect the condition and volume of the tonsils [9,10].

In the diagnosis of the lymphoid tissue condition of the pharyngeal tonsils, it was also proposed to analyze the smears-prints, rhinocytogram and cytogram in the microscope, and then calculate the percentage of segmental neutrophils by special formulas to the total number of cells [5,7]. The disadvantage of this method is that the quality of the cytogram and the percentage of segmental neutrophils depends not only on the presence or absence of chronic processes in the nasopharyngeal cavity, but also on the hypertrophy of the tonsils, but also on the quality of the oral cavity (teeth,

tongue, salivary glands, palate) condition, the presence of pathology of the digestive system, morphological changes in the inflammation of the nasopharyngeal cavity of various etiologies [3,4,9].

Sagiroglu A., Acer N., Okuducu H., Ertekin T., Erkan M., Durmaz E., Aydin M., Yilmaz S., Zaararsiz G. (2017) described a method for measuring weirdest using ultrasound. scientists have proven that the volume of ultrasound measured using ultrasound (3.6 ± 2.5 ml) corresponds to the practical volume (3.9 ± 2.1 ml) of the removed magnified fluid [10,11].

However, the degree of arising and hypertrophy detected during epi and mesopharyngoscopy depends not only on the actual size of the tonsils, but also on the anatomical structure and characteristics of the pharynx, the width of the arches, inflammatory infiltrates. However, this method was not taken into account in the above method [4,6,9].

Thus, despite the specific importance of each of the above and a number of other methods, they do not allow evaluating the size of the pharyngeal tonsils with an appropriate level of reliability.

However, in children with adenoids there is an increase in microcirculation in hypertrophied pharyngeal sphincters, which indicates an increase in the functional activity of the Pirogov lymphoid ring [4,5,6]. In the many studied literatures, when morphologically analyzed for each drug of apical tissue, hyperplasia of lymphoid tissue was confirmed by the presence of dilatation of a large number of vessels in the dilated state [7, 10]. However, it is not always possible to accurately and competently analyze and adequately assess blood flow in the pharyngeal tonsils. The main reasons for this may be due to the lack of appropriate manufactured equipment and the fact that the author's samples are used only for research purposes, not implemented in daily clinical practice [8,10].

The purpose of the study. Development of a well-informed and effective method based on the results of transcervical ultrasound examination in pharyngeal tonsils hypertrophy.

Materials and methods. To achieve this aim, 164 patients with pharyngeal tonsils hypertrophy were examined. In 88 out of 164 examined patients, epipharyngoscopy revealed grade I pharyngeal tonsil hypertrophy, 35 grade II, and 41 grade III pharyngeal tonsil hypertrophy. The average age of the examined patients was 12.4 years. The ratio of boys and girls is 1:2. All patients underwent ultrasound of the pharyngeal tonsil using the Mindray DC-N6 machine using linear transducers with an operating frequency of 5–12 MHz. The study was carried out from the sides in the area of the projection of the pharyngeal tonsils; the transverse diameter (width) of the tonsil was measured. Mathematical processing was carried out directly from the general Excel 7.0 data matrix using the capabilities of the STTGRAPH 5.1 program, the standard deviation and representativeness errors were determined.

To assess the microvascular architecture of the pharyngeal tonsils, color Doppler mapping technology was used, which consisted of recording blood flow, encoding these flow in different colors, and placing the resulting image on a two-dimensional black-and-white image of the object under study. The essence of the method is based on the reflection of ultrasound waves with varying frequency from the studied objects. The pharyngeal tonsil (research area) is divided into many (250-500) control volume points, which become the targets of the depicted blood flow. In each control volume, a Dopplerographic measurement of blood flow is performed. Depending on the direction and average velocity of blood flow, the sonographic system (scanner) encodes the corresponding image point in a certain color.

Thus, for the formation of a color Doppler image in each control zone, the direction and average velocity of blood flow has a color representation on the screen.

After assessing the microangioarchitectonics of the adenoids, the following types of vascularization were identified: type I (normal vascularization) - there is a relative blood flow; type II (hypovascular) - relatively low circulation in the tissue of the tonsil, the presence of a pair of blood vessels in the thickness of the tonsil; type III (hypervascularization) is divided into 3 subtypes: 1 - type - hypervascularization of the surrounding tissue; type 2 - intratonsil hypervascularization; type 3 - intratonsil and hypervascularization of the surrounding tissue (mixed).

The basis for the development of a well-informed and effective method of diagnosing adenoid hypertrophy lies in the results of transcervical ultrasound examination of the pharyngeal tonsils.

Results and discussion. In the group of those examined with degree I adenoid hypertrophy, the transverse diameter (width) of the tonsil does not reach 13 mm, was detected in 46.4%, 18–22 mm in 36.6%, and the maximum values of this indicator were 23–28 mm and more - in 14% of patients. In the group examined with II degree of hypertrophy of the pharyngeal tonsil, the transverse diameter (width) of the adenoids, not equal to 14 mm, was detected in 17.3%, 17–19 mm in 38.3%, and the maximum indicator was 21–30 mm or more. – In 42.4% of patients.

In the group of those examined with III degree of adenoid hypertrophy, there were no patients with a transverse diameter (width) of the pharyngeal tonsil not exceeding 16 mm; with a diameter of 17-23 mm was 34.3% of the examined, and with a maximum value of this indicator of 24-30 mm or more - 66.7% of patients.

Thus, the frequency of occurrence of tonsils with a transverse diameter of 17–23 mm (46.4, 38.3 and 34.3%, respectively) in patients with I, II and III degrees of pharyngeal tonsil hypertrophy did not differ statistically ($p>0.05$). In the group of patients with II and III degree of adenoid hypertrophy, there were also no statistical differences in the incidence of tonsils with a transverse diameter of 21–30 mm or more (42.4 and 66.7%, respectively) ($p>0.05$).

This proves the unreliability of the results of epipharyngoscopy and the parameters of the tonsil detected by ultrasound scanning, and the conditional characterization of the existing gradation of the degrees of adenoid hypertrophy. During this study of the microangioarchitectonics of the pharyngeal tonsil, it was found that in the tonsil with a transverse diameter of up to 16 mm, hypervascularization of the adenoids occurred in 18% of cases; in the tonsil with a transverse diameter of 17–21 mm - in 36.9% of cases ($p = 0.015$); in the tonsil with a transverse diameter of 22-30 mm or more - in 65.3% of cases ($p = 0.026$).

The diagnostic technique for hypertrophy of the pharyngeal tonsil, based on Doppler ultrasound examination of the tonsil with visualization of vascularization, registration of the rate of movement of blood flow, encryption of these data in different tones and formation of the resulting pattern on a two-dimensional black and white image of the object under study, are indicated by the fact that in the tonsil with a transverse diameter of 17– 23 and 22–30 mm and more, an increase in blood flow is observed, in contrast to tonsils with a smaller transverse diameter, up to 16 mm.

At the same time, the threshold value of indicators of hypertrophy of the pharyngeal tonsil is enhanced vascularization (hypervascularization of the surrounding tissue, intramtonsilar hypervascularization, intratonsilar and hypervascularization of the surrounding tissue (mixed)) of the tonsil with a transverse diameter of 22 mm or more. The proposed method allows you to quickly and efficiently visualize the linear dimensions of the palatine tonsils and the degree of their vascularization.

Nowadays, along with other modern methods such as MRI, MSCT, the most common type of X-ray diagnosis is Doppler ultrasound, which can provide more detailed information, is relatively easy to treat, and is one of the non-invasive, inexpensive methods. Modern Doppler ultrasound instruments are a method with many advantages, in particular, they allow to compare the qualitative and quantitative vascularization properties of different organs and tissues by mapping. Hypertrophy of the pharyngeal tonsils may vary depending on the characteristics of the image and the degree of intensity of vascularization of lymphoid tissue.

Thus, the obtained data show that the proposed method in the diagnosis of adenoid hypertrophy is highly effective and informative, which significantly simplifies the process of diagnosis in outpatient and inpatient settings and significantly improves the quality of treatment of hypertrophy of the pharyngeal tonsils, and no does not require the use of medications.

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