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Acute tonsillitis on the Pediatric District: Etiologic Diagnosis and Treatment

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Relevance. Acute tonsillitis is a common virus ailment among children. The activators of acute tonsillitis are usually viri, much less often - bacteria. Among the latter the most important causative agent of acute tonsillitis is streptococcus progenes. Use of antibiotics in case of acute tonsillitis is determined by complexity of bacteriological confirmation (verification) of streptococcus progenes infection in the outpatient setting and fear of complications development. Usage of sensitive and high-avid bedside test allows to avoid shortcomings of cultural investigation connected with late respond (at 4th-5th day) and material transportation to bacteriological laboratory. Such bedside test allows to define streptococcus progenes causation (aetiology) in 5-10 minutes. **Object:** children acute tonsillitis diagnostic and treatment optimization. **Patients and methods.** In case of follow-up of one particular district covered by childhealth care in number of 935 children in age of from 0 months to 18 years 79 cases of acute tonsillitis were registered. Were educed such signs as posterior pharyngeal wall hyperemia, implication of palatine tonsils in inflammatory process. Apart from general methods rapid tests were provided. **Results.** The population occurrence of acute tonsillitis showed 84 cases among 1000 children, of tonsillitis caused by streptococcus progenes - 7,3 cases among 1000 children. SG (specific gravity) of streptococcus progenes among other acute tonsillitis is 8,8%. Children with acute tonsillitis were referred for medication intake of amoxicillin (50 mg/kg during 10 days). **Conclusion.** Use of instant exclusion (diagnosis) of streptococcus progenes infection allows to reduce antibiotic treatment to 8,8% in case of children acute tonsillitis.

Key words: children, acute tonsillitis, streptococcus progenes, population occurrence, diagnostics, rapid test, antibiotic treatment.

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JUSTIFICATION

Acute tonsillitis is one of the most common acute infectious diseases: it can be found in children of all ages, starting from the 2nd half of the first year of life [1]. Activators of acute tonsillitis can be both viri (adeno-, rhino-, coronary et al.) and bacteria (β -hemolytic *streptococci*, *corynebacterium diphtheriae*, *arcanobacterium haemolyticum*, etc.). As a symptom tonsillitis occurs as part of the Marshall Syndrome [2, 3], Behçet's disease [4], Stevens-Johnson syndrome, malignancies, hemoblastosis, and upon exposure to irritative factors (hot liquid, alkalis, acids, etc.) [5].

The most important bacterial agent of acute tonsillitis is β -hemolytic streptococcus of group A (BHSA), which can cause both infectious (peritonsillar abscess, abscess of the peripharyngeal space phlegmon of the neck, etc.), and immune-mediated complications (acute rheumatic fever, acute glomerulonephritis, PANDAS syndrome). The prevalence of asymptomatic BHSA carriers in children reaches 12% (95% CI 9-14) [6]. According to American authors, up to 30% of cases of acute pharyngitis are caused by BHSA [7]. According to Norwegian authors, the specific weight of acute tonsillitis is 7.5% among the other upper respiratory tract infections in children aged 4-5 years. [8] At the same time, we did not meet any data on the population frequency of the disease, in particular of BHSA-etiology, in both Russian and foreign literature.

The difficulties of confirming a BHSA-infection bacteriologically in an outpatient setting, the lack of specific symptoms together with the fear of complications often cause excessive prescription of antibacterial drugs for children with acute tonsillitis. Thus, according to Russian authors, children with tonsillopharyngitis are appointed antibiotics in 85-100% of outpatient cases, in more than 40% of which - parenterally [9].

To identify patients older than 3 years with a sore throat requiring antibiotic treatment, Canadian researchers (W. McIsaac et al.) developed a clinical point scale on which the following indicators are assessed: body temperature above 38°C, cough absence, enlarged and sore cervical lymph nodes, tonsils swelling, patient's age. Children with an estimate of 2 or more points on a W. McIsaac scale are recommended to undergo cultural study, which remains the "gold standard" of examining a patient with signs of acute tonsillitis [10]. When the sum of points on a W. McIsaac scale is more than 4, empiric antibacterial drug prescription is recommended [11].

The Union of pediatricians of Russia has proposed an algorithm of diagnosing and treating acute tonsillitis: it is based on the use of a highly specific 0.87 (95% CI 0,84-0,89) and sensitive 0.96 (95% CI 0,95-0,97) express-test to identify BHSA (Streptatest). This method is based on the immunochromatographic study of specific group A streptococcus antigen in the

material obtained from the swab from the mucosa off the back of the throat or tonsils [12, 13]. The result can be evaluated in 5-10 minutes at the bedside.

The goal of this study – to optimize the diagnosing and treatment of acute tonsillitis in children in an outpatient setting.

To reach this goal, the following tasks were solved: determining the population frequency of acute tonsillitis; evaluating the sensitivity and specificity of the W. McIsaac clinical scale for separating cases of acute tonsillitis of BHSA-etiology in comparison with the Streptatest results.

PATIENTS AND METHODS

In the conditions of one pediatric district of an Orel city child polyclinic counting 935 children aged 0 to 18 years old, we registered all the cases of acute febrile diseases in children aged from 6 months to 18 years, accompanied by hyperemia of the posterior pharyngeal wall with the involvement of the palatine tonsils in the inflammatory process as a hyperemia / imposition. Such cases we defined as acute tonsillitis (ICD-10: J03).

In total 79 cases of acute tonsillitis of infectious etiology were registered over the period of a year, herewith 2 cases (2.5%) of PFAPA syndrome in children aged 3 and 5 years were excluded from the total sample.

All patients with symptoms of acute tonsillitis underwent a general clinical examination: clinical blood and urine analyses; throat swab to *C. diphtheriae*; in cases of suspected infectious mononucleosis - diagnosis using PCR real-time Epstein-Barr virus DNA detection; otoscopy; throat swab of microflora and antibiotic sensitivity (in case of acute tonsillitis relapse within 1 year). Due to the absence of a bacteriological laboratory at the clinic where the study was conducted, taking into account the logistics of the material delivery to the central bacteriological laboratory and receiving the response only in 4-5 days, all patients with symptoms of acute tonsillitis were further investigated with the help of Streptatest.

The somatic status of children with acute tonsillitis was evaluated also by the means of McIsaac clinical scales. A comparison between Streptatest results and the assessment on McIsaac scale (score greater than 3 – BHSA- infection risk) allowed to determine the sensitivity and specificity of the scale. The sensitivity (SE) of the scale is given by:

$$SE = TP / (TP + FN) \times 100\%,$$

where TP - true-positive results, FN - false-negative results.

Specificity (SP) was determined by the following formula:

$$SP = TN / (TN + FP) \times 100\%,$$

where TN - true-negative results, FP - false-positive results.

RESULTS

The population frequency of acute tonsillitis, depending on the age of the patients, is presented in Table 1; it was 84 per 1,000 children of all ages with a peak between the ages of 1 to 3 years (341 per 1,000 children; two thirds of all cases of acute tonsillitis). In children of 7-18 years, the incidence of acute tonsillitis was only 32 per 1,000.

Table 1. *The frequency of acute tonsillitis, depending on age*

Index	Age,						
	0-11 months (7/85)	1-3 (54/158)	4-6 (12/153)	7-10 (3/197)	11-14 (2/203)	15-18 (1/139)	Total (79/935)
Population frequency, ‰	82	34	78	15	10	7	84
The age distribution of cases ‰	8.9	68.4	15.2	3.8	2.5	12	100

Note. In brackets: numerator - the number of registered cases of acute tonsillitis per year, denominator - all children of this age

In 7 cases out of 79 (8.8%) in children aged 4 to 18 years, positive Streptatest testified a BHSA-etiology of acute tonsillitis. These included 3 cases of scarlet fever (children over 6 years), the diagnosis of which was established on the basis of a characteristic exanthema with positive Filatov symptom, the presence of effusion in the tonsils, as well as characterizing phasing of the disease. In the remaining 4 patients, acute tonsillitis of BHSA etiology was accompanied by febrile fever with intoxication, imposition on the tonsils, leukocytosis $> 15 \times 10^9/L$, refusal of food (in 3), and increase in regional lymph nodes.

The population frequency of acute tonsillitis of BHSA-etiology (including scarlet fever) was 7.3 per 1,000 children aged 0 to 18, or 10.1 per 1,000 children aged 4-18 years.

Table 2. *The frequency of symptoms in acute tonsillitis of different etiologies*

Signs	BHSA n = 7		Viral n = 72	
	abs.	%	abs.	%
T $> 39^\circ C$	7	100	36	50.0
Overlays on the tonsils	7	100	63	87.5
Lymphadenopathy	4	57.0	18	25.0
Rhinitis, conjunctivitis	1	14.3	60	75.9
Thrush	-	-	2	2.8
Exanthema	3	42.8	1	14
Hepatosplenomegaly	-	-	4	5.6
Refusal to eat	5	71.4	15	20.8
Leukocytosis $> 15 \times 10^9/L$	6	85.7	21	29.2

Note. BHSA - β -hemolytic streptococcus group A.

In 72 of 79 patients (91.1%) a viral etiology of acute tonsillitis was established on the basis of clinical data and a negative Streptatest (Table 2). In 4 of these (goes on: in 13 and 66, 79: it is not clear how much cases are under consideration - 79 or 72) children aged 4-7 years, infectious mononucleosis was diagnosed (based on clinical data and positive PCR for viral DNA of Epstein-Barr). In all these cases there is an increase in temperature to $> 39^{\circ} \text{C}$, imposition on tonsils, lymphadenopathy (in 3 patients), nasal congestion without discharge, hepatosplenomegaly, leukocytosis $> 15 \times 10^9/\text{L}$.

In 13 patients (mostly at the age of 2-3 years) an adenoviral etiology of acute tonsillitis was clinically supposed based on the severity and persistence of fever, overlays on the tonsils, upper respiratory tract catarrh and conjunctivitis, lymphadenopathy, disorders of the general condition (meals and drinks refusions) in combination with leukocytosis $> 15 \times 10^9/\text{l}$. The data on symptoms frequency of accompanying acute tonsillitis, depending on etiology, is shown in Table. 2.

Clarification of the etiological factor of acute tonsillitis determined the tactics of treatment. We used amoxicillin at a dose of 50 mg/kg per day as eradication BHSA therapy; due to intolerance to this antibiotic, one patient has been appointed with cephalexin; the course of treatment was 10 days [9]. The positive effect of antibacterial treatment was marked in 24-48 hours; no relapses of acute tonsillitis and no streptococcal infection complications were observed.

There indications for antibiotic therapy were a combination of viral acute tonsillitis with acute media otitis with an appropriate clinical and otoscope picture in 4 children aged 2-4 years, and an early postoperative period (6 weeks) after correcting the Fallot tetralogy in a patient aged 1 year 8 months. These children were appointed to amoxiclav at 50mg/kg per day for 5-7 days.

Two children with infectious mononucleosis were hospitalized at the initiative of their parents; at the hospital they received cefazolin (7 days), and symptomatic treatment, including infusion. In 6 infants with acute viral tonsillitis parents began antibiotic therapy on their own on the 2nd-3rd day of illness. In the absence of a positive effect in 48 hours and after a conversation with the doctor, mothers agreed to cancel the antimicrobials, which has not led to the development of complications.

The rest of the children with acute viral tonsillitis did not take antibiotics: interferon intranasally and paracetamol at a temperature above 39°C were used; older children took oral rehydration with juices and fruit drinks; young children – with glucose-salt solutions with molarity of up to 60 mmol/l (two-fold rehydron dilution).

The clinical McIsaac scale showed its low specificity (8.3%) as compared to the Streptatest. However, its high sensitivity (100%) allows it to be used to isolate a group of patients older than 3 years requiring diagnosis of BHSA-tonsillitis via Streptatest (Table 3).

Table 3. Comparison of the results of the acute tonsillitis diagnosis using Streptatest with McIsaac clinical scale

Rating on a McIsaac scale , scores	Diagnosis using Streptatest			
	BHSA (n = 7)		Viral (n = 26)	
	abs.	%	abs.	%
0-1	-	-	2	7.7
2-3	1	14.2	3	11.5
≥ 4	6	85.8	21	80.8

CONCLUSION

The obtained population frequency of acute tonsillitis (84 per 1,000) points to the importance of this pathology in pediatric practice. Herewith, the specific weight of acute tonsillitis of BHSA-etiology was very small - only 8.8%. We were unable to compare the population frequency of acute tonsillitis with the literature data, despite a search in databases.

A high specific weight of acute viral tonsillitis defines a minor need for antibacterial treatment of acute tonsillitis and once again demonstrates the groundlessness of wide application of antibiotics for this disease.

Realities of the present time require to conduct BHSA-infections diagnosis at the bedside of a patient. The data demonstrates that the standard research tool for the district physician should be Streptatest, allowing to prescribe an adequate treatment in almost all cases of BHSA infections and to avoid unnecessary antibiotic therapy in a bulk of patients with acute tonsillitis. This is also evidenced by WL Lean et al. recently published meta-analysis [14].

Since bacterial tonsillitis is observed mainly in children older than 3 years, express-diagnosis with Streptatest can be limited only to cases of suspected streptococcal infection in children from 3 years of age.

CONFLICT OF INTEREST

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