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INTEGRAL SCORING SCALE AS A BASIS FOR AN OBJECTIVE ASSESSMENT OF THE STATE OF PATIENTS WITH CHRONIC TONSILLITIS AND THE EFFECTIVENESS OF THEIR TREATMENT

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ABSTRACT

Introduction: Currently, the methods of integrated assessment of patient's condition based on scoring of separate multidirectional changes in subjective clinical and objective laboratory parameters are used in medical science more and more often.

The aim: Based on the identified differences in clinical manifestations and immunological indicators of patients of different age with chronic tonsillitis and patients with no signs of ENT pathology, to develop an integral scoring scale as a basis for an objective assessment of the state of patients with CT and the effectiveness of their treatment.

Materials and methods: The clinical signs and immunological factors were evaluated. Patient's general information, such as age, the presence of allergies, was also taken into account. Based on the analysis of the data array, a scoring system for assessing the clinical and immunological state of patients was proposed.

Results: The abnormalities in clinical and immunological assessment in adult population with no signs of ENT pathology (control group) are 2.75 times higher than in healthy children, while in case of chronic tonsillitis the differences between children and adults in terms of integral abnormalities are 1.66 ($p < 0.05$).

Conclusions: Integral scoring assessment of clinical and immunological tests makes it possible to provide more objective evaluation of the state of lymphoid tissue of tonsils and the immunity in patients with chronic tonsillitis, which may become an objective basis for choosing patient management strategy, as well as for estimating treatment efficacy.

KEY WORDS: Chronic tonsillitis (CT), scoring system

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INTRODUCTION

Currently, the methods of integrated assessment of patient's condition based on scoring of separate multidirectional changes in subjective clinical and objective laboratory parameters are used in medical science more and more often [1, 2]. At the same time, the majority of studies assessing the patient's condition are not carried out comprehensively, and the abnormal findings are presented only in descriptive form without any total integration of clinical and laboratory signs and a graded assessment of the severity of abnormalities, which contributes to subjectivity in the choice of therapy. Working towards the progress and objectification in assessing the condition of patients with ENT diseases, we tried to describe patient's condition using the case of assessing clinical and immunological parameters in patients of different age with chronic tonsillitis (CT) and patients with no signs of ENT pathology. It is based on scoring method of assessing the state of patients with chronic rhinosinusitis suggested by G.D. Tarasova [2], which we adapted in clinical aspects and significantly expanded in immunological aspects. The same as in the parent study, a 4-point scale (from 0 to 3 points) is used for assessment.

THE AIM

Based on the identified differences in clinical manifestations and immunological indicators of patients of different age with chronic tonsillitis and patients with no signs of ENT pathology, to develop an integral scoring scale as a basis for an objective assessment of the state of patients with CT and the effectiveness of their treatment.

MATERIALS AND METHODS

127 patients with CT and 30 patients of control group (patients with no signs of ENT pathology) were recruited in the study. The age of children was 5-18 years, and the age of adults – 19-55 years.

Radial immunodiffusion technique was used to quantitate serum immunoglobulin (IgA, IgM, IgG), sIgA in the oropharyngeal secretion. Coon's method was used to detect antibodies to connective tissue antigens in patients with chronic tonsillitis and normal patients.

Test for detection of circulating immune complexes is based on sedimentation of coarsely dispersed complex conglomerates of protein origin under the influence of polyatomic alcohol, namely polyethyleneglycol at a concentration of 3.75%. After sedimentation and subsequent

Table I. Degree of hyperemia of palatine arches

Severity of signs	Point
No hyperemia	0
Mild hyperemia of palatine arches	1
High-grade hyperemia of palatine arches and mucous membrane of tonsils	2
Hyperemia of palatine arches, mucous membrane of tonsils, lateral and posterior pharyngeal walls	3

Table II. Caseous detritus in tonsillar lacunae

Severity of signs	Point
No lacuna content	0
Very few caseous plugs	1
Mild caseous and purulent discharge from lacunae on palpation	2
Purulent content in lacunae	3

Table III. Tonsillar size

Severity of signs	Point
Within the arch line	0
Slightly extending beyond the palatine arches	1
Different sizes of the right and left tonsils extending beyond the palatine arches	2
Severe tonsil atrophy	3

Table IV. State of the anterior lymph nodes

Severity of signs	Point
Within normal limits	0
Mildly enlarged lymph nodes	1
Occasionally enlarged and painful	2
Continuously enlarged lymph nodes, occasional tenderness on palpation	3

Table V. Number of exacerbations per year

Severity of signs	Point
No exacerbations	0
1 exacerbation per year without ARVI (acute respiratory viral infection)	1
Exacerbation 2-3 times per year	2
Exacerbation > 3 times per year	3

Table VI. Concomitant diseases

Severity of signs	Point
No metatonsillar pathology	0
Chronic diseases of gastrointestinal tract, thyroid gland	1
Chronic kidney diseases, chronic joint diseases with negative rheumatoid factor test	2
Diseases of heart, joints, connective tissues with positive rheumatoid factor test	3

Table VII. Body thermometry in case of exacerbation of CT

Severity of signs	Point
Normal temperature	0
Subfebrile temperature	1
Temperature is about 38 0C	2
Temperature is > 38	3

Table VIII. Local immunity (immunoglobulins, lactoferrin, antiinflammatory cytokines, interferons)

Severity of signs	Point
No definite abnormalities from age-appropriate normal value	0
Abnormality in one of the parameter	1
Abnormalities in two parameters	2
Abnormalities in three or more parameters	3

centrifugation, the optical density of the precipitate was measured using spectrophotometric techniques and evaluated in optical-density units.

T-lymphocyte count of different subpopulations was determined by the method of homogeneous spotting of antibodies (Ortho, USA) in fluorescence microscope Olympus (Japan).

The content of nonspecific protective factors in the oropharyngeal secretion, such as lysozyme, lactoferrin, IL-1, IL-8, γ -IFN, α -IFN, as well as IgE, IgG₄ in blood serum was detected by immunoenzyme method using Stat-Fax 2100 analyzer (USA) and corresponding reagents kit produced by Cytokine (Russian Federation), Vector-Best (Russian Federation), Hyman (Germany), Assauro (Netherlands). Nephelometer was used to determine lysozyme concentrations in the oropharyngeal secretion.

All the materials were collected in clinical remission at 8-9 o'clock in the morning in the fasted state. The super-

natant fraction was obtained by centrifugation (120g) and stored at -20°C for 20 days.

In carrying out the research, the principles of bioethics and the legal requirements and requirements for conducting biomedical research were respected, namely: the Helsinki Declaration (2000), the Constitution (1996) and the Civil Code of Ukraine (2006), the Fundamentals of Ukrainian Health Law (1992), Guidelines for clinical investigations of the Ministry of Health of Ukraine No. 42-7.0: 2005 "Medicines. Appropriate clinical practice" (2005), Order of the Ministry of Health of Ukraine No. 66" On Approval of the Procedure for Conducting Clinical Trials of Medicinal Products and Examination of Materials for Clinical Trials and Model Regulations on the Ethics Commission" (2006), Law of Ukraine No. 3447-IV" On the Protection of Animals from ill-treatment" (2006), which is confirmed by the corresponding

Table IX. Systemic humoral immunity (antibodies to *Streptococcus pyogenes*, levels of immunoglobulins of various classes)

Severity of signs	Point
No definite downward abnormalities	0
Abnormality in one of the parameter	1
Abnormalities in 2-3 parameters	2
Abnormalities in more than three parameters	3

Table X. Systemic cellular immunity (T-lymphocytes and their subpopulations; functional activity of T-lymphocytes, production of cytokines by mitogens in vitro)

Severity of signs	Point
Nothing abnormal detected	0
Abnormality in one of the parameter	1
Abnormalities in two parameters	2
Abnormalities in more than two parameters	3

Table XI. Factors of innate immunity (number of monocytes, neutrophils, eosinophils, natural killers, natural killers activity, phagocytic activity)

Severity of signs	Point
No definite downward abnormalities*	0
Abnormality in one of the parameter	1
Abnormalities in two parameters	2
Abnormalities in more than two parameters	3

* - upward abnormalities in case of CT occur very rarely, and in our opinion only during exacerbation

Table XII. Immunopathological factors (circulating immune complex, antibodies to DNA (Ana-sreen), antibodies to protein-polysaccharide antigen of connective tissue such as Cole)

Severity of signs	Point
No positive response	0
Abnormality in one of the parameter	1
Abnormalities in two parameters	2
Abnormality in three or more parameters	3

conclusion of the Ethical Committee of Shupyk National Medical Academy of Postgraduate Education, Kyiv, Ukraine (2015).

Clinical assessment of the patient's state was based on the following signs (Tables I; II; III; IV; V; VI; VII).

Immunity status assessment was carried out by analyzing immunograms in accordance with the immunoassay protocols of ENT patients [3]. We investigated 20 different immunological parameters to identify the most informative (Tables VIII; IX; X; XI; XII).

Patient's general information (Tables XIII, XIV).

Student's t-test was used for statistical analysis.

Table XII. Patient's age (according to the recommendations of the European Association of Otolaryngologists and Clinical Immunologists, tonsillectomy is not indicated for children under 5, Gent, 1999).

Severity of signs	Point
Mature age (41-55 years)	0
From 19 to 40 years	1
From 8 to 18 years	2
From 5 to 7 years	3

Table XIV. Allergy of any localization

Severity of signs	Point
No allergy	0
Mono-allergy	1
Poly-allergy	2
History of severe allergic reactions	3

RESULTS

The integral data of clinical and immunological studies of various parameters obtained in analyzing patients of each group and shown in points are summarized in Tables XV and XVI. The comparison was made in the following groups: children with no signs of ENT pathology (under 18 years), children with CT at the age of 5-18 years, adult patients with no signs of ENT pathology and adult patients with CT.

The presented data show that patients of the control group at an early age have no significant abnormalities in clinical state of tonsils (mean score – 0.32), while in children with CT the average score is 1.38. The ratio of these indicators is 1:4.31. Adult patients with no signs of ENT pathology have abnormalities in clinical state of tonsils upon a range of parameters in comparison with a similar group of an early age, and the average score of clinical signs is 0.28. The number of clinical abnormalities increases in adult patients with CT and is 1.52. The ratio of these indicators is 1:5.42.

The most prominent clinical feature of the state of tonsil in children with no signs of ENT pathology was tonsillar size (1.6 points). Hyperemia of the arches (0.3 points) and caseous detritus in lacunae (0.4 points) were less prominent features. In adult patients with no signs of ENT pathology the following clinical features of the state of tonsils were the most prominent: hyperemia of the arches (1.0 point), caseous detritus (0.5 points), enlarged anterior cervical lymph nodes (0.3 points) and tonsillar size (0.2 points) (Figure 1).

The data presented in Figure 1 indicate that the leading clinical sign in healthy donors at an early age is the tonsillar size, and in adult donors it is hyperemia of the arches.

In children and adults with CT, the severity of clinical signs of the state of tonsils significantly differed only upon one criterion – hyperemia of the anterior palatine arches (1.2 points and 2.2 points, respectively). There were no significant differences in other clinical signs (Figure 2).

As can be seen from Figure 2, the leading clinical sign in patients with CT at an early age is the presence of caseous

Table XV. Scoring of clinical signs of patients of different age with no ENT pathology and patients with CT

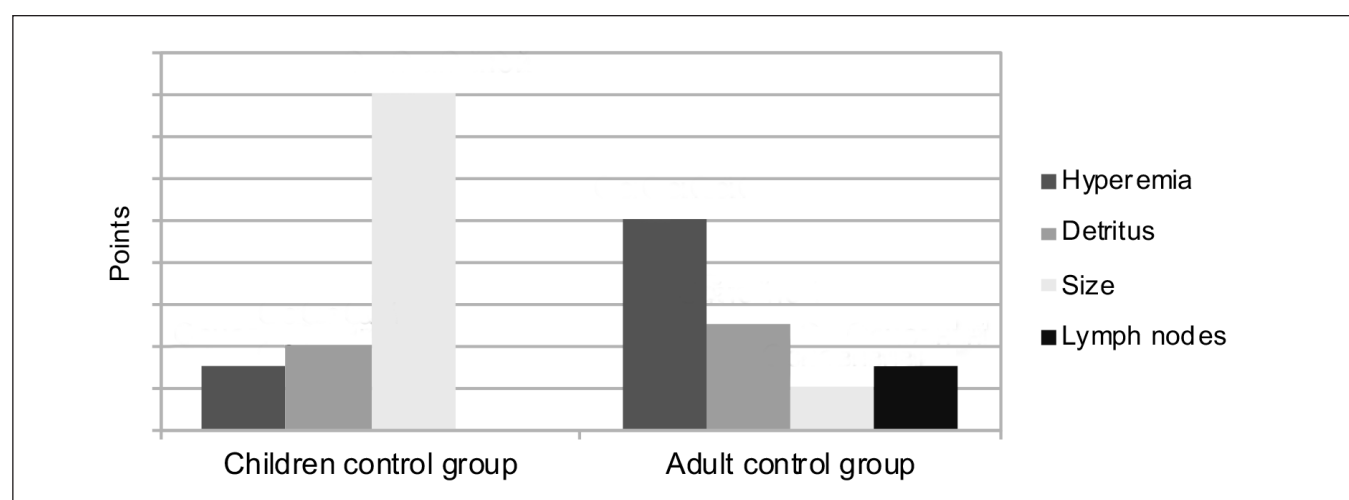
Signs	Mean score			
	Children of control group	Children with CT	Adults of control group	Adults with CT
Hyperemia of arches	0.3	1.2	1.0	2.2
Caseous detritus	0.4	2.1	0.5	2.1
Tonsillar size	1.6	0.9	0.2	1.1
Lymph nodes	0	1.8	0.3	1.9
Exacerbation	0	0.5	0	0.8
Concomitant diseases	0	0.6	0	0.6
Temperature	0	2.1	0	2.0
Average	0.32	1.31*	0.28	1.52*

Note: * - reliable in relation to the control group in each age group ($p < 0.02$).

Table XVI. Scoring of abnormal findings in immunograms of patients of different age with no signs of ENT pathology and patients with CT

Signs	Mean score			
	Children of control group	Children with CT	Adults of control group	Adults with CT
Local immunity	0	1.7	0.8	2.3
Systemic humoral	0	0.9	0.6	2.1
Systemic cellular	0.2	0.8	0.7	2.8
Innate immunity	0.2	0.9	1.2	2.6
Immunopathological factors	0	0.2	0.8	2.1
Average	0.08	1.04*	0.82	2.38*

Note: * - reliable in relation to the control group in each age group ($p < 0.02$).


Figure 1. Differences in clinical signs of tonsils in healthy children and adults.

detritus of tonsils and fever response, and in adult patients with CT it is hyperemia of the arches.

More distinct differences between patients with no signs of ENT pathology were revealed while studying the immunological parameters of the local and systemic immunity (Table 16). If children with no signs of ENT pathology had minor abnormalities (mean value of the scoring assessment of abnormalities in immunograms – 0.08 points), then in

adult patients with no signs of ENT pathology this value was 0.82 points ($p < 0.001$). In patients with CT, the abnormalities in all parameters of the immune system exceeded by 2 points (2 or more abnormalities in the indicators of the state of the immune system), the mean score was 2.38 ($p < 0.01$).

The summing up of the scores of clinical and immunological studies show the same tendency – the abnormal-

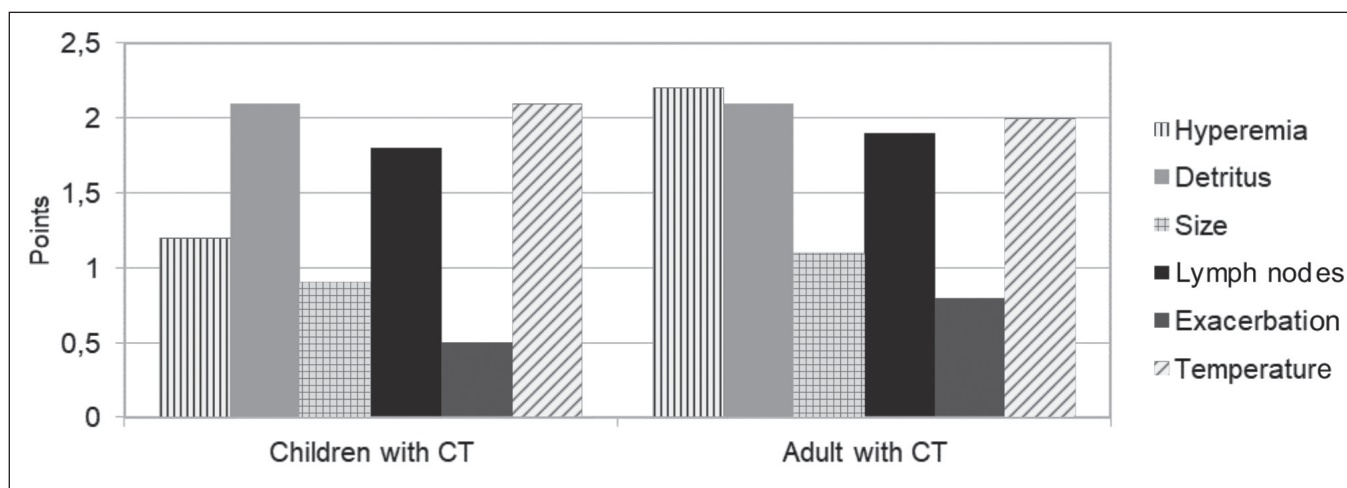


Figure 2. Differences in clinical signs of tonsils in children and adults with CT.

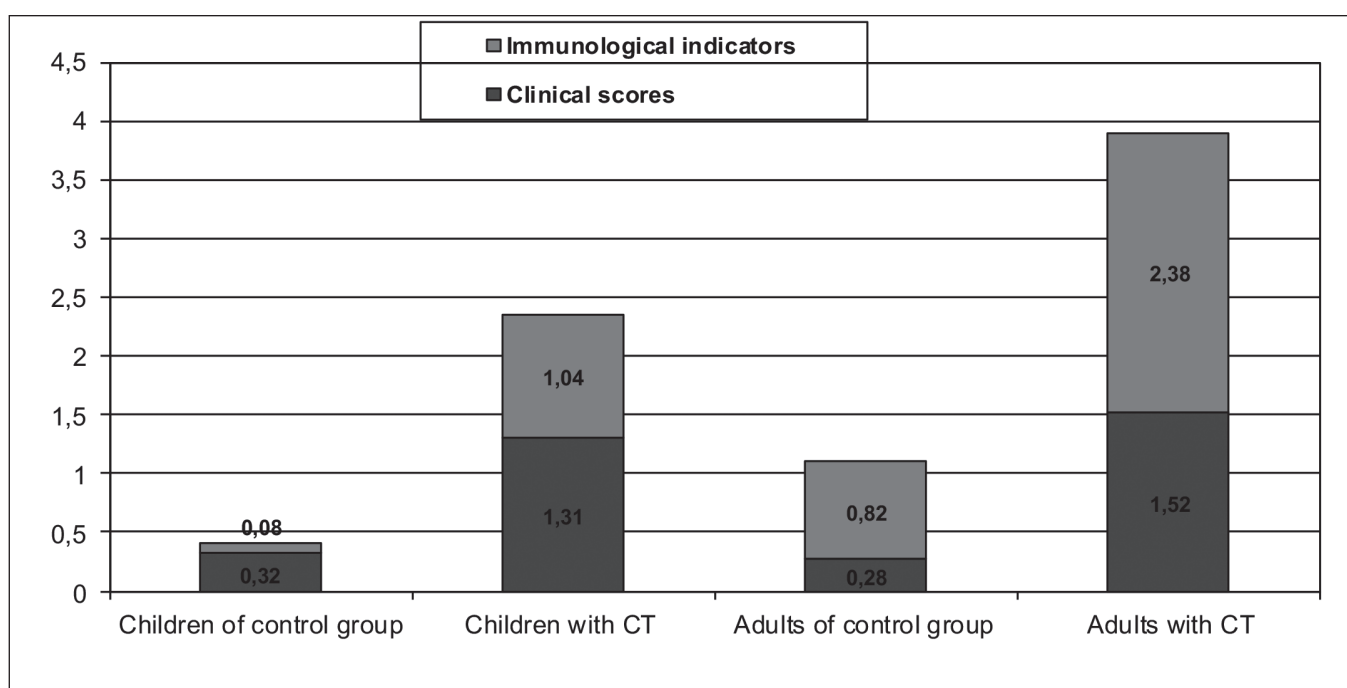


Figure 3. Integral expression of abnormalities in clinical and immunological parameters in patients with CT and patients of control groups of different age.

ities in clinical and immunological assessment in adult population with no signs of ENT pathology (control group) are 2.75 times higher than in healthy children, while in case of CT the differences between children and adults in terms of integral abnormalities are 1.66 ($p < 0.05$) (Figure 3).

It can be also noted that in integral clinical and immunological assessment of functional state of tonsils in children with CT, immunological signs are of the same importance as clinical ones, and in adult patients with CT they are even more important than clinical signs. Taking notice of these signs in diagnosis of CT can more accurately identify the functional reserve of tonsils, and therefore more objectively determine the indications for surgical treatment.

DISCUSSION

In our opinion, the revealed abnormalities in clinical signs and immunological parameters in children and adults with no signs of ENT pathology can be due to individual characteristics of the immune system. These abnormalities can also be a physiological reaction of the lymphoid tissue of the pharynx to a constant antigen load [4, 5], or as a consequence of recurrent diseases of the pharynx (for example ARI), and can serve as an initial level of reference.

Clinical manifestations of chronic tonsillitis are often subjective. Unbiased evaluation of the general immunological status is difficult due to a large number of tests that do not determine definite changes in chronic tonsillitis. The author realizes that abnormalities in immunological parameters may

also be due to another (non-tonsillar) pathology, therefore, the study involved tests that were more specific and informative for inflammatory diseases of the oropharynx: a-IFN, sIgA and antibodies to *Streptococcus pyogenes* (since the determination of the total amount of IgA, IgM, IgG is indicative) [5].

The presented materials indicate that using scoring system of assessment of clinical and immunological signs one can integrally and therefore more objectively evaluate the state of patients with pathological processes of tonsils and the efficacy of their treatment. In our opinion, integral scoring assessment can also help in choice of treatment strategy; however it does not exclude further development and implementation of other tests.

CONCLUSIONS

1. The mean score of clinical signs in children with CT is 4 times higher than that in children with no signs of ENT pathology ($p < 0.02$). The average score of clinical signs in adult patients with CT is 5 times higher than that in adults with no signs of ENT pathology ($p < 0.02$).
2. The mean score of immunological manifestations in children with CT is 13 times higher than that in children with no signs of ENT pathology ($p < 0.01$). The average score of immunological manifestations in adult patients with CT is 2.9 times higher than that in adult patients with no signs of ENT pathology ($p < 0.01$).
3. The mean integral score in children with CT is 5.85 higher than that in children with no signs of ENT pathology ($p < 0.05$). The mean integral score in adults with CT is 3.5 times higher than that in adult patients with no signs of ENT pathology ($p < 0.05$).
4. Integral scoring assessment of clinical and immunological tests makes it possible to provide more objective evaluation of the state of lymphoid tissue of tonsils and

the immunity in patients with CT, which may become an objective basis for choosing patient management strategy, as well as for estimating treatment efficacy.

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According to the order of the Authorship.

Conflict of interest:

The Authors declare no conflict of interest.

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