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Clinical Features of Chronic Tonsillitis on the Background of Dental Caries

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Abstract Scientific studies analyzing the relationship between chronic tonsillitis and dental caries show that pathogenic microorganisms on the teeth contribute to the onset and development of infectious processes in the tonsils, which leads to an exacerbation of tonsillitis. The purpose of the study is to study the clinical features of chronic tonsillitis on the background of dental caries. The study materials were patients with dental caries aged 18 to 65 years who were treated as inpatients with chronic tonsillitis in the department of "Otorhinolaryngology" during 2022-2024. Thus, it can be concluded that the analysis of clinical-biochemical indicators in predicting the recurrence of chronic tonsillitis in patients with dental caries and their assessment according to the course of the disease allows to reduce the recurrence and improve the quality of life of patients.

Keywords Chronic tonsillitis, Dental caries, Clinical course, Immunological examination, Biochemical examination

1. Introduction

Chronic tonsillitis is a common infectious-allergic disease, manifested by persistent chronic inflammation of the tonsils. Chronic tonsillitis is a common infectious-allergic disease, characterized by chronic inflammation of the tonsils in our republic. Chronic tonsillitis is a common infectious-allergic disease, characterized by chronic inflammation of the tonsils [1,8,15]. Chronic tonsillitis is the most common of upper respiratory tract diseases, occurring in 4-10% of adults and 12-15% of children. The disease is becoming increasingly widespread among the population and, as a result, has the potential to cause negative consequences and lead to disability, which is becoming increasingly important socially [2,4,10,16]. Despite the great achievements we have made in medicine today, the number of patients with chronic tonsillitis in otorhinolaryngology remains relatively high. This problem remains one of the most pressing problems in modern medicine. Chronic tonsillitis has become a problem not only for otolaryngologists, but also for pediatricians, cardiologists, neurologists, rheumatologists, therapists and other specialists. This problem requires consideration not only from a clinical, but also from a general biological point of view. Taking into account the above, improving the methods of early detection, diagnosis and treatment of chronic tonsillitis remains one of the urgent problems of modern otolaryngology [1,5,8,12,17].

Scientific studies that have analyzed the relationship between chronic tonsillitis and dental caries show that pathogenic microorganisms in the teeth contribute to the initiation and development of infectious processes in the tonsils, which leads to the exacerbation of tonsillitis [4,7,13]. Studies confirm that pathogens of infection in the teeth exacerbate inflammatory processes in the tonsils, as a result of which chronic tonsillitis develops. Dental caries and chronic tonsillitis are two important and widespread pathologies of the human body. Both diseases have a significant impact on the immune system, microflora and the general condition of the body. Therefore, the coexistence of dental caries and chronic tonsillitis creates complex clinical and biochemical issues for patients. This literature review is aimed at analyzing the pathogenesis, clinical manifestations and treatment methods of this problem [2,3,9,11,15].

Despite the widespread use of conservative methods in the treatment of chronic tonsillitis today, their effectiveness is not always high. The world literature has widely documented the impact of chronic tonsillitis on all internal organs, including the cardiovascular, nervous, endocrine and other systems [6,7,14]. Therefore, one of the important problems is the assessment of the clinical and biochemical characteristics of the course of chronic tonsillitis in patients with dental caries.

The purpose of the study is to study the clinical features of the course of chronic tonsillitis against the background of dental caries.

2. Material and Methods

were patients with dental caries aged 18 to 65 years who were treated as inpatients with chronic tonsillitis in the department of "Otorhinolaryngology" of the Multidisciplinary Clinic of the Tashkent Medical Academy during 2022-2024.

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The control group consisted of 20 practically healthy children. In order to achieve the set task, 140 patients treated at the Multidisciplinary Clinic of the Tashkent Medical Academy and the clinic of the Tashkent State Institute of Dentistry during 2022-2024 and 20 healthy people in the control group were involved in the study. In order to assess the course of the disease, the patients were divided into 3 groups: group 1 consisted of 70 patients with chronic tonsillitis against the background of dental caries. Group 2 consisted of 40 patients with chronic tonsillitis only. Group 3 was made up of only 30 patients with dental caries.

Study design and participants. All patients underwent a comprehensive examination. This examination included collecting a complete medical history from patients, conducting an examination of ENT organs, administering questionnaires to patients, clinical and laboratory examination, functional examination methods, ENT endoscopy, 3D or multispiral computed tomography examination, microbiological examination, biochemical examination. All results were evaluated using statistical analysis. When analyzing the age and gender of patients, in group 1 there were 30 patients aged 18-44, 28 patients aged 45-59, and 12 patients aged 60-74. In group 2 there were 19 patients aged 18-44, 16 aged 45-59, 5 patients aged 60-74, in group 3 there were 14 patients aged 18-44, 12 aged 45-59, and 4 patients aged 60-74. In general, patients of working age, that is, patients aged 18-44, made up the majority, which indicates the social importance of the disease. The average age was 42.8±0.8 years in group 1, 41.9±0.9 years in group 2, and 41.5±0.8 years in group 3. It follows that there was almost no difference in age and gender in all groups. Clinical observation in dynamics of patients with chronic tonsillitis, general clinical and special functional examinations, methods of statistical processing of the obtained materials allowed us to solve the tasks set before us. *Data analysis.* The assessment of the reliability of the differences in relative and mean values was carried out using Student's standard criteria. In the absence of a normal distribution, Pearson's chi-square median test was used.

3. Research Results and Their Discussion

The distribution of patients with chronic tonsillitis by clinical forms of the disease is reflected. According to the results obtained, toxic-allergic forms of chronic tonsillitis predominate in both groups. In particular, in the first group, the toxic-allergic form of the 1st degree accounted for the majority of patients, which indicates general intoxication and the activity of immune-allergic reactions in the body. A significant share of this form in the second group confirms that the systemic effect of the chronic infection is preserved.

The relatively low incidence of the simple form in both groups indicates that the disease often proceeds as a general pathological process, not limited to local symptoms. The fact that the toxic-allergic form of the 2nd degree is more often detected in the first group than in the second group indicates that severe forms of chronic tonsillitis prevail in this group and the risk of developing complications is high.

Thus, it has been scientifically proven that the division of patients by the form of chronic tonsillitis is of great importance in assessing the severity of the disease, individualizing treatment tactics, and choosing surgical or conservative treatment methods.

During pharyngoscopy examination of chronic tonsillitis, local changes were detected: caseous-purulent congestion in 17 cases (85%), liquid pus in the lacunae in 19 cases (95%), cicatricial adhesions in the tonsils in 8 cases (40%), hyperplasia in the anterior and posterior arches in 16 cases (80%), hyperemia in the anterior arches in 14 cases (70%), and swelling of the upper part of the anterior arches in 13 cases (65%). Chronic course of the focal infectious-inflammatory process leads to a deterioration in the general condition of the body. Chronic infectious-allergic conditions lead to changes in regional lymph nodes. In many patients, it was found that the maxillary and cervical lymph nodes are enlarged and painful on palpation. Chronic tonsillitis is widespread among ENT diseases and has important clinical significance as a constant focus of infection in the body. Oral infections, especially dental caries, play an important role in the course and complications of chronic tonsillitis. Microbiological and biochemical changes associated with dental caries can negatively affect the functioning of the immune system and cause tonsillitis to become chronic. In this regard, it is important to study the clinical and biochemical characteristics of chronic tonsillitis in patients with dental caries.

In response to the initial entry of an infectious agent, an inflammatory process develops. Activation of nonspecific defense factors leads to increased vascular permeability, increased blood flow, and increased activity of macrophages and polymorphonuclear cell elements. Activated macrophages produce more than 60 mediators, including immunocytokines and free radicals. Cytokines have pleiotropic (i.e., multifaceted) biological effects on various cell types and are mainly involved in the formation and regulation of the body's defense responses. Local defense is achieved by the formation of a characteristic inflammatory response after the interaction of pathogens with pattern-recognition receptors (membrane Toll-like receptors). In this process, proinflammatory cytokines synthesized in the inflammatory focus affect almost all cells involved in inflammation - granulocytes, macrophages, fibroblasts, endothelial and epithelial cells, and then T- and B-lymphocytes. Cytokines are produced by lymphocytes and macrophages, located in the epithelium of the mucous membrane. Serum transudate and salivary glands have been noted as sources of cytokines in saliva. Epithelial cells also produce cytokines when they come into contact with microorganisms. It is known that interleukin-10 (IL-10) plays a leading role in a number of chronic and autoimmune diseases. IL-10 was first described as a factor inhibiting the synthesis of cytokines (cytokine synthesis inhibitory factor, CIF). It has the property of suppressing several inflammatory cytokines (IL-1, IL-6, IL-8, GM-CSF, FNO-α), therefore

it is among the anti-inflammatory mediators. The balance between pro-inflammatory and anti-inflammatory cytokines is the basis for the formation of the correct immune response to the antigen of the microorganism.

Immunomodulatory drugs occupy one of the main places in the complex treatment of children with chronic tonsillitis. There is no doubt that this group of drugs should be used both during the period of exacerbation and during remission. However, such drugs should be selected in accordance with the immune status of each patient and should affect the impaired link of immunopathogenesis in this disease. Because the main factors regulating the activity of cells involved in the pathogenesis of chronic tonsillitis are cytokines. Therefore, it is advisable to assess the correlation between the main groups of cytokines during remission and relapse in children with chronic tonsillitis.

Table 1. Amount of anti-inflammatory immunocytokines in patients, pg/ml

Patient group	IL-13, pg/ml	IL-6, pg/ml	FNO-α, pg/ml
1 group	68,3±4,29	22,5±2,33	24,6±1,81
2 group	55,4±3,35	16,7±1,12	19,1±1,19
Control group	43,9±1,44	10,8±1,5	14,9±1,74

Note: p<0.05 – compared to the group; p<0.05 – compared to the indicators of healthy people

According to the data presented in Table 1, the level of inflammatory cytokines in the blood of patients with chronic tonsillitis in response to microbial aggression is significantly higher (p<0.01) than in healthy children. IL-1, IL-6, TNF-α have the ability to stimulate the activity of many types of leukocytes (T- and B-lymphocytes, natural killers, monocytes, neutrophils). The wide range of biological functions they perform leads to one thing: the formation of a local inflammatory reaction and an acute phase response at the body level. However, it was found that the level of each cytokine in children with chronic tonsillitis attacks was lower than the corresponding concentration in the blood of children with chronic tonsillitis (p<0.01). Nowadays, more and more attention is paid to indicators indicating the state of local immunity in assessing the severity of inflammatory processes. These indicators are recognized as parameters that provide more information from the point of view of diagnosis and prognosis. Taking this into account, at the next stage of the work, we studied the state of cytokines (cytokine status) in the fluid released from the palatal lacunae (Table 2).

Table 2. The amount of immunocytokines in the separation of the palatal folds in patients with chronic tonsillitis, pg/ml

Patient group	IL-10, pg/ml	IL-6, pg/ml	FNO-α, pg\ml
1 group	22,6±1,67	11,1±1,19	8,68±0,79
2 group	10,3±1,05	5,33±0,67	not identified
Control group	14,8±1,09	4,95±0,39	not identified

Note: p<0.05 – compared to the group; p<0.05 – compared to the indicators of healthy people

As observed in serum, high concentrations of pro-inflammatory immunocytokines were detected both in the fluid secreted from the lacunae of inflamed tonsils and in children with tonsillitis. In the main group of patients, these indicators were significantly lower than in healthy subjects: the level of IL-1β was significantly reduced, and the average values for IL-6 were also reduced. TNF-α (tumor necrosis factor) was not detected in either the main group of patients or the healthy subjects.

Table 3. The amount of interleukin-10 in the blood serum of the examined patients in the lacunae of the palatine folds

Patient group	The amount of IL-10 in blood serum, pg/ml	The amount of IL-10 in the lacunae of the palate, pg/ml
1 group	17,6±1,91	4±0,5
2 group	25,5±1,25	19,5±4,0
Control group	27,6±1,24	17,0±3,0

Note: p<0.05 – compared to the group; p<0.05 – compared to the indicators of healthy people

TNF-α, like IL-1, IL-6 and IL-8, is a chemoattractant for monocytes and multinucleated leukocytes. Under the influence of these immunocytokines, endothelial cells express the chemotaxis factor gene, thereby ensuring the exit of neutrophils from the circulatory system. In addition, TNF-α is a strong activating factor that also affects oxidative metabolism: under its influence, the production of superoxide anion by neutrophils increases by 2–3 times.

Thus, TNF-α has a systemic effect on the entire body and is actively involved in the defense against infections. The absence of detectable levels of TNF-α and a significant decrease in interleukin indicators indicate decompensation of local immunity, that is, the presence of local immunodeficiency, leading to functional insufficiency.

As we mentioned earlier, the balance of pro-inflammatory and anti-inflammatory cytokines is of fundamental importance in the formation of a proper immune response to microbial antigens.

In our studies, changes in the concentration of anti-inflammatory immunocytokine IL-10 were detected both in the blood and in the fluid extracted from the lacunae of the palatal folds (Table 3).

The amount of IL-10 in the comparison group did not differ from that of healthy donors, both in blood serum and in the fluid extracted from the lacunae of the palatal ridge. A high concentration of IL-10 is one of the reasons for the decrease in immune reactivity and the long-term preservation (persistence) of microbes in tissues. IL-10 inhibits the activation of the Th-cell population by acting on monocytes /macrophages. This suppresses the activity of a number of inflammatory cytokines (IL-1, IL-6, IL-8 and FNO-α) and also limits the expression of MNS-II class major histocompatibility complex antigens. As a result, there is a decrease in the synthesis of nitrogen oxides and other bactericidal substances.

The conducted analyses revealed that in the group of patients with chronic tonsillitis, the balance between pro-inflammatory and anti-inflammatory immunocytokines is disturbed. Such a ratio of mediators can lead to a violation of the balance controlling the activity of the inflammatory process, the chronic nature of inflammation, and the disruption of the process of regeneration of the tissues of the palatine tonsils. Considering that cytokines are mediators with a local effect, it is more expedient to measure them by isolating proteins from the tissues of this area or in natural biological fluids. In the scientific literature, there are studies on the study of cytokines in tears, gingival fluid, oral cavity lavage, urine, cerebrospinal and peritoneal fluids, as well as wound secretions.

The amount of mediators in the blood serum reflects general (systemic) inflammatory processes and is a sign of diseases of the local pest. In children with acute tonsillitis, the results of secretions obtained from the lacunae of the palatine folds show the immune reactivity of these tissues.

It is noteworthy that the amount of cytokines in the fluid separated from the lacunae does not correspond directly to the values in the blood serum. This shows that local immunity works autonomously, that is, independently.

All patients underwent general clinical, otorhinolaryngological and dental examinations. Local biochemical tests were performed on saliva and exudate from tonsil lacunae. All patients underwent general clinical, otorhinolaryngological and dental examinations. Local biochemical tests were performed on saliva and exudate from tonsil lacunae.

Salivary composition is an important diagnostic medium that reflects the level of inflammation in the oral cavity and the state of local immune protection.

Table 4. Local biochemical indicators of saliva (M±m)

Indicators	Group 1 (n=70)	Group 2 (n=40)	Group 3 (n=30)	p
pH	6,12 ±0,06	6,65 ±0,07	6,28 ±0,08	<0,05
Total protein, g/l	2,28 ±0,05	1,74 ±0,04	2,05 ±0,06	<0,05
Sialic acids, mmol/l	0,36 ±0,02	0,24 ±0,01	0,31 ±0,02	<0,05
Lysozyme, μg/ml	7,2 ±0,3	10,8 ±0,4	8,6 ±0,3	<0,05
sIgA, mg/l	82,5 ±2,8	109,4 ±3,5	94,6 ±3,1	<0,05

According to Table 4, the lowest pH was observed in patients of group 1, which indicates the predominance of an acidic environment in the oral cavity. A significant increase in the amount of total protein and sialic acids indicates the active inflammatory process.

A sharp decrease in lysozyme and sIgA in group 1 indicated a decrease in local nonspecific and specific immune defense factors. In groups 2 and 3, these changes were less pronounced ($p<0.05$).

Exudate in the tonsil lacunae is of great importance in assessing the depth of the inflammatory process in chronic tonsillitis.

Table 5. Biochemical indicators of exudate of tonsil lacunae (M±m)

Indicators	Group 1 (n=70)	Group 2 (n=40)	p
Proteolytic activity, conditional unit	4,6 ±0,2	3,1 ±0,1	<0,05
Malondialdehyde (MDA), nmol/ml	5,2 ±0,3	3,7 ±0,2	<0,05
Catalase, μkat/l	12,4 ±0,5	16,8 ±0,6	<0,05
Superoxide dismutase, unit	1,42 ±0,06	1,89 ±0,07	<0,05

A significant increase in the level of proteolytic enzymes and MDA in patients of group 1 indicated an increase in the processes of inflammation and lipid peroxidation in the tonsil tissues. At the same time, a decrease in antioxidant defense enzymes confirms the presence of a state of oxidative stress ($p<0.05$). Thus, in patients with chronic tonsillitis against the background of dental caries, local biochemical changes are most pronounced, a decrease in immune defense factors in saliva leads to a continuation of the chronic inflammatory process, and activation of oxidative stress and proteolysis processes in the palatine tonsils is associated with a severe course of the disease. Analysis of clinical and biochemical indicators in predicting the recurrence of chronic tonsillitis in patients with dental caries and their assessment according to the course of the disease allows reducing recurrences and improving the quality of life of patients.

4. Summary

1. In patients with dental caries, the simple form of chronic tonsillitis was found in 40.0% of patients, toxic-allergic form 1 degree in 42.9% of patients, toxico-allergic form 2 degree in 17.1% of patients, according to the prevalence of dental caries, the severity of chronic tonsillitis was proved to be proportional;
2. When studying biochemical changes in patients with chronic tonsillitis against the background of dental caries, it was found that cytokine IL-13 was 68.3±4.29 pg/ml, IL-6 22.5±2.33 pg/ml, FNO-α 24.6±1.81 pg/ml, and it was 1.5 times higher than the comparison group and 2 times higher than the control group. it was proved that IL-10 was 22.6±1.67 pg\ml, IL-6 11.1± 1.19 pg\ml, and FNO-a 8.68±0.79 pg\ml;
3. Analyzing clinical-biochemical indicators in predicting the recurrence of chronic tonsillitis in patients with dental caries and evaluating them according to the course of the disease allows to reduce the recurrence and improve the quality of life of patients.

Conflict of Interests

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

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Availability of Data and Materials

All data generated or analysed during this study are included in this published article.

Authors' Contributions

All authors contributed to the design and interpretation of the study and to further drafts. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

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